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AMERICAN MACHINIST

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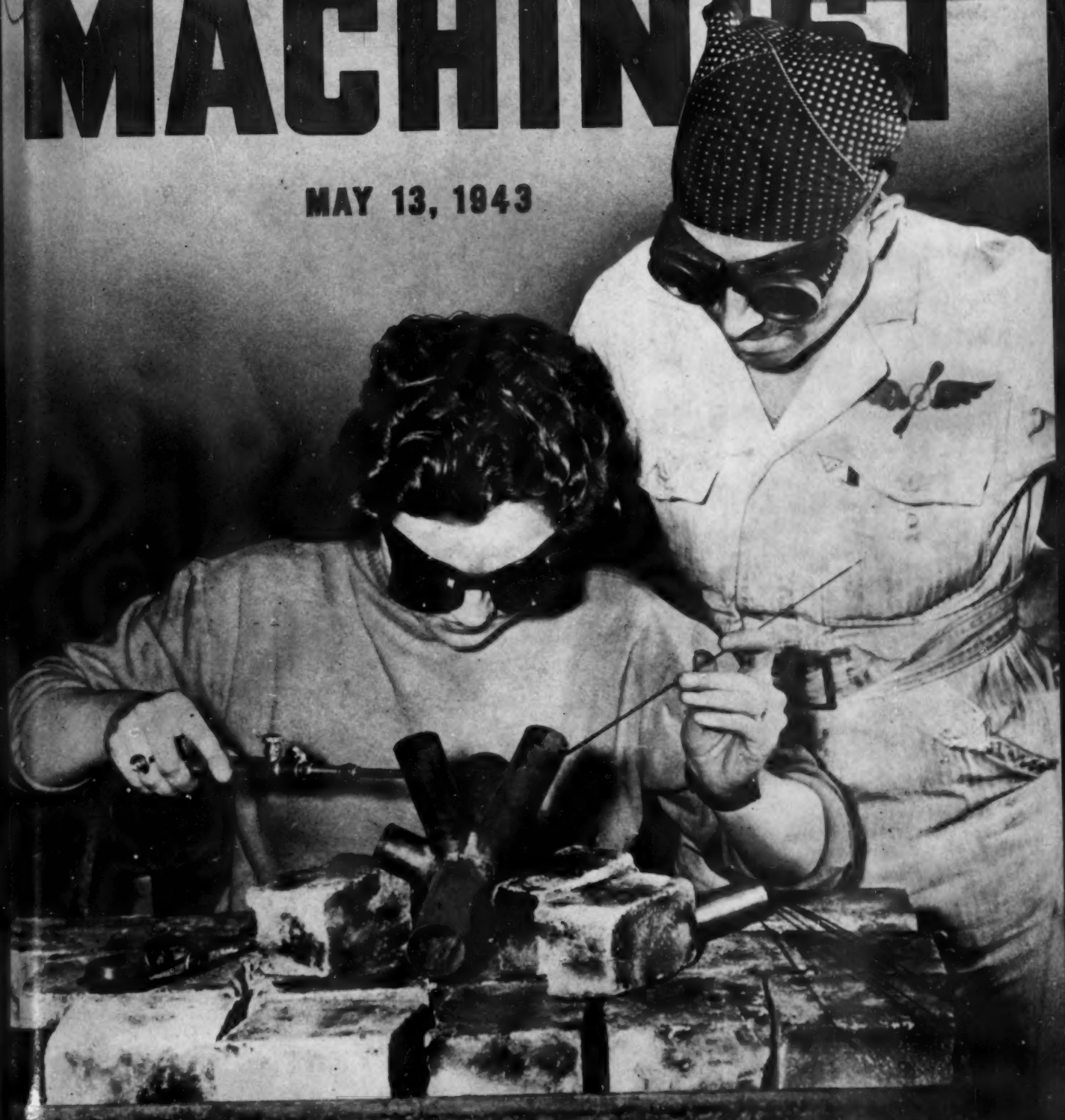

Aircraft Welders Need Special Training—Page 112

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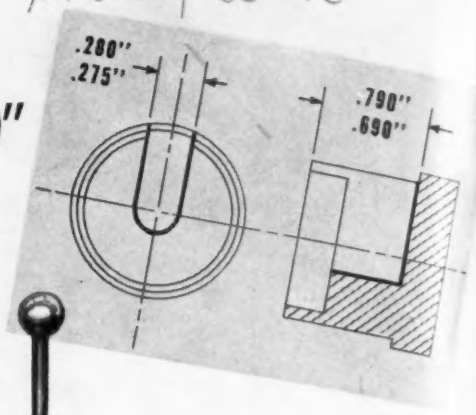
JUST 6 SECONDS

To Finish a .280" x .690" Slot from the Solid



Heald Bore-Matic *plus* Heald tooling boosts production to *600 per hour* on shell fuse parts

Finishing a slot .280" wide x .690" deep from the solid is ordinarily a comparatively slow process . . . too slow in fact to produce brass shell fuse parts requiring this operation in the huge quantities needed today. Heald field engineers when called in on the job recommended, not a battery of machines, but the single compact Heald Bore-Matic shown above. This Bore-Matic is a No. 49 machine, double-end, with six boring heads carrying end-mills and a six station fixture mounted on a hydraulic cross-slide used for feeding in a side cut. Three fuse parts are slotted simultaneously, three others being loaded meanwhile. Production is 600 per hour, entirely meeting the customers' requirements. Such high production is obtained with a standard Heald Bore-Matic, all units being standard with the exception of tools and fixture. And this job is not an isolated case. Every day Heald Engineering works out equally successful arrangements for getting out more work with more precision. Let's get to work now on your problems in precision boring, turning, facing, chamfering and grooving. Write, phone, or wire us today.

Tech

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MANUFACTURERS OF PRECISION BORING AND PRECISION GRINDING MACHINES

AMERICAN MACHINIST

May 13, 1943

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AMERICAN MACHINIST chips

California, State of War . . . *According to WPB figures reported by the National Industrial Conference Board, California led the Nation in war contracts awarded various states from June, 1940, through November, 1942. A grand total of over 10 billion smackers . . . half of it for aircraft alone. The "Big Ten" of war work among the states ran in order as follows: California, Michigan, New York, Ohio, New Jersey, Pennsylvania, Illinois, Connecticut, Massachusetts and Indiana.*

o

Worth Fighting Against . . . The effects of Nazi-decreed "total mobilization" in the different countries of Europe were recently summarized as follows:

Norway—Every man between 18 and 55 and every women between 21 and 40 have been ordered to serve the Nazi war effort.

Holland—Offenders against German production, distribution and labor market relations can be punished by death. A 54-hour work week has been decreed.

France — the Compulsory Labor Service decides which French workmen shall be permitted to remain in their present employment, which are to be sent to other places in France and which will be sent to Germany for the duration.

Belgium — Children 14 years of age are now being assigned to farmers as farm help. The farmers may refuse to allow the real parents of the children to see them.

Greece — Mobilization ordered for "civilian purposes" of all Greeks between the ages of 16 and 45.

Bulgaria — All business establishments placed under a civil mobilization order patterned to fit (guess what) the German plan.

Poland — Having been exploited from the first day of German occupation, further mobilization can only be achieved, and is being achieved, by pressing the Poles into the Wehrmacht.

We have plenty of difficulties here in America, but certainly nothing approaching the horror that is loose in Europe today.

News About Shoes . . . *In revising its rules on shoe rationing, the OPA made allowance for those persons who must buy special shoes for work on hazardous jobs. This is to remind Metal-Working executives that workers who require safety shoes may apply to local War Price Rationing Boards for special certificates to be issued to workers for the purchase of these shoes, or the worker himself may make the application. Incidentally, it's about time some perverted punster started to talk about "No. 17 Shoe-pons." Or isn't it?*

o

Alaska's War Minerals . . . Vital minerals have been added to the Nation's supply of war materials through the experiments and explorations of the Bureau of Mines. In Alaska, tin, mercury and magnesia have already been made available and it is expected that in the near future new stores of tungsten, chromite, copper and nickel will be found. Something for post-war planners to make a note of.

o

War Reading . . . *The new 1943 edition of N. W. Ayer & Sons Directory of Newspapers and Periodicals has, we do not doubt, opened many an eye. Magazine sales as a whole were up 27,000,000 in 1942 over 1941. Reflecting the wartime interest in acquiring technical knowledge and learning new trades, circulation of technical periodicals were up by 5,477,311. Trade publications added 3,190,305. That's a lot of people searching for "know-how."*

o

Hot Cakes Department . . . Requests for reprints of "The Tools of Our Trade" (February 18 issue of *American Machinist*) keep hurrying in. Same for No. 2 in the series of employee training helps, "How to Run a Drilling Machine" (April 15 issue). Latest comment on the "Tools" Section comes from Fred Dull of Monarch Machine Tool Co. who says, "This is well compiled and we have in mind getting about 500 for distribution to new employees."

o

On Staying Ahead of the Times . . . *One of the main jobs of* American Machinist *editors is to keep searching out and reporting not only the best in current metal-working practice, but the new ideas and trends which seem to forecast important advantages to the industry. As an example, we hear a lot and read a lot these days about advances in welded construction. As far back as March 10, 1937, Fred H. Colvin —Grand Old Man of Metal-Working— had an article in* American Machinist *entitled "Fleetwings Welds All-Metal Planes." We call that real pioneering.*

o

Post-War Pricing . . . Across our desk the other day came the latest issue of "Trundle Talks" . . . No. 52 in the series of interesting and sound messages sent out by George T. Trundle, Jr., on behalf of his engineering company. We are taking the liberty of quoting the following viewpoints included in this little booklet:

"How are we going to sustain a high level of public purchasing power in the post-war era?

"By paying higher wages in terms of dollars? This is the wrong answer. This is the road toward inflation and higher prices. High wages accompanied by high prices are meaningless.

"The proper road to increased buying power lies in giving the people *more value per dollar*. This method employs the proved cycle of redesign of product for better quality and manufacturing economies, sales and merchandising to stimulate mass markets, and lower prices to the consumer.

"This, to my mind, is the only method which will avoid inflation—and it is just as vital to manufacturers, as it is to the consuming public, that inflation be avoided.

"Furthermore, this is the method that will assure survival, in the post-war competitive picture, for capital goods industries as well as consumer goods industries.

"Only when mass markets make possible an increase in manufacturing volume, do manufacturers buy capital goods. Railroads don't buy locomotives when traffic is falling off, nor do manufacturers buy machine tools when sales are dwindling."

o

Pegasus Rides Again . . . *Congratulations to the Fairchild Engine & Airplane Corp. for the very swell job of publishing their monthly magazine "The Pegasus." It is very attractively and intelligently handled throughout, and we are particularly interested in the series of articles prepared by members of the staff of the company's Durmold Division to debunk certain phases of the "plastic" airplane development and to outline the real story.*

MARINE REDUCTION UNIT

750 H.P.
from
850 R. P. M.
to
500 R. P. M.

Marine drive manufacturers, faced with the problem of making better reduction units than ever before, have found that bevel gear planetary units meet and surpass their production and performance requirements.

Examine the advantages these units offer:

1. Compact, light, straight-line design
   Unit shown is only 18" diameter.
2. High load capacity
   Multiple pinions share load equally.
3. Fast, accurate manufacture
   Bevel gears cut by efficient generating method in standard Gleason machines.
4. Assembly control
   Bevel gears adjusted in assembly for control of backlash.
5. Range of Application
   Reductions from approximately 1.5/1 to 2.5/1. Similiar units also used as reverse drives.

Extend these advantages to your drive applications. The Gleason Works, with over 75 years' experience in the bevel gear industry, stands ready to help you. Our engineers will be pleased to aid in designing your planetary gears and in specifying the correct Gleason machines for their manufacture.

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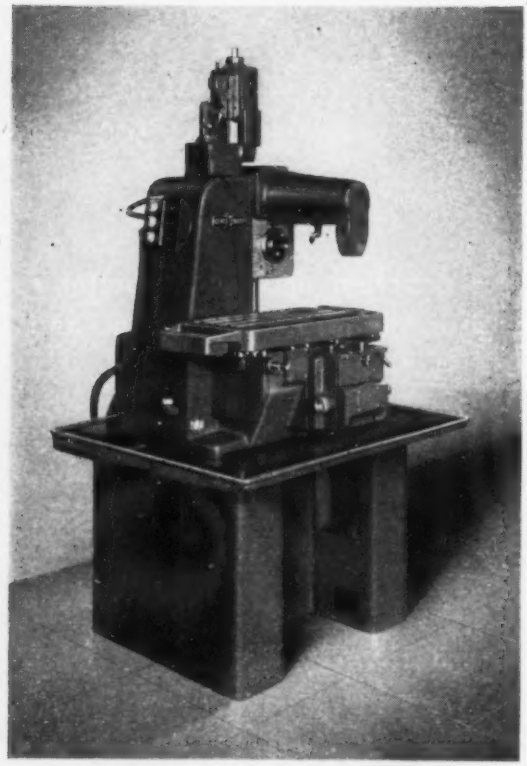
ARMY E NAVY

A MIGHTY USEFUL MACHINE TO HAVE AROUND

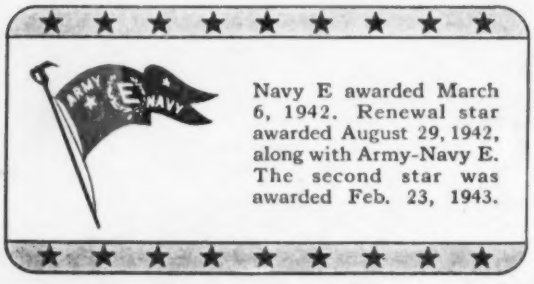
CINCINNATI 0-8 MILLING MACHINE



Horizontal cuts only — vertical cuts only — a vertical and then a horizontal cut — two accurately spaced vertical cuts, and many more combinations are well within the range of the CINCINNATI 0-8 Plain Automatic Milling Machine equipped with automatic Rise and Fall Spindle Carrier. And changing from one automatic cutting cycle to another is a simple operation requiring less than one minute.

When it comes to milling a wide variety of small parts fast, accurately, in any quantity, your best bet is a CINCINNATI 0-8. You're going to be interested in the production possibilities of this versatile milling machine. It's a noteworthy contribution to the science of metal cutting by the engineers here at Milling Headquarters, and you'll find it a useful machine to have around.

Specifications catalog M-964-1 gives complete information on all features and why they will prove beneficial to you. A copy will be sent on request. Or look in Sweet's Catalog File for Mechanical Industries for brief description.



Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

CINCINNATI

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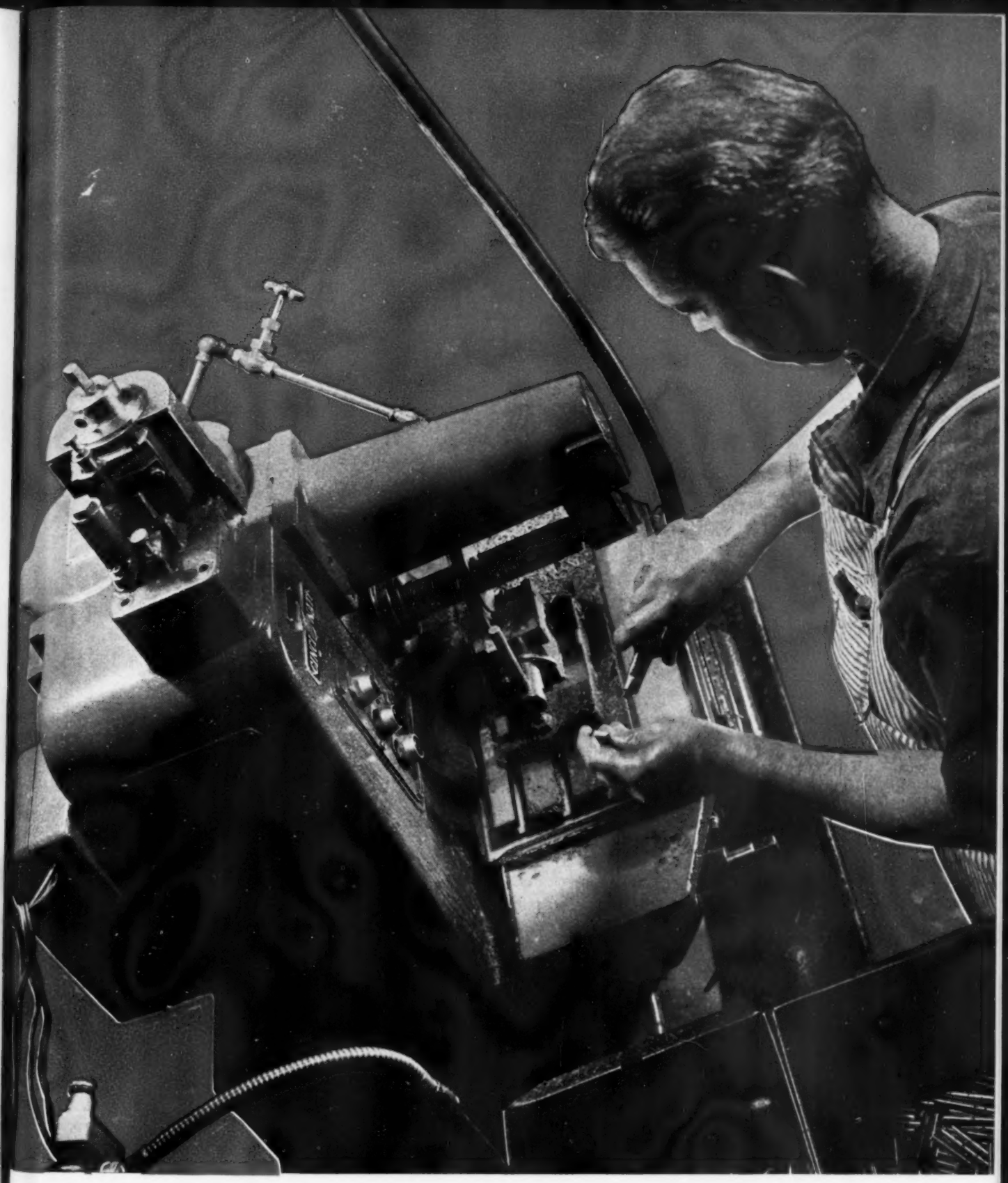

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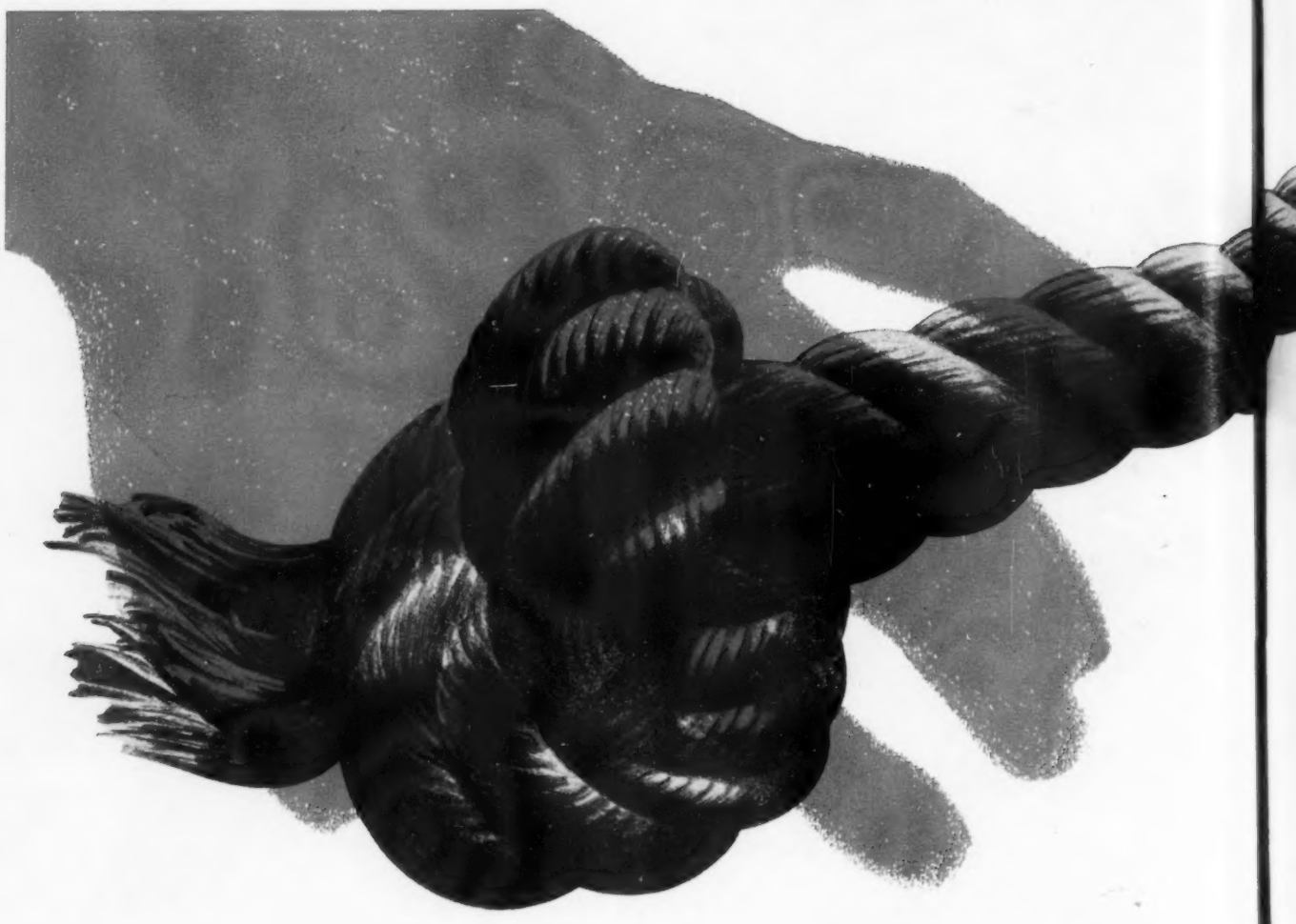


Men have done many strange, terrible and wonderful things with the simple tool known as rope — and one man in our time used a piece of it to change the shape of the world.

For this man had a vision. He thought he could see an endless stream of automobiles flowing from a moving conveyor belt — commencing as iron ore, crude rubber, chemicals and flax, and finishing as completed cars.

It was the greatest technical dream of our time, and it began with a crude experiment one day in 1914. He hitched a length of rope to a chassis which was dragged through the plant, while six workmen picked up parts, assembling them as they traveled with the job . . . Thus was born the famous moving belt technique of assembly line mass production that has revolutionized American industry.

The Rope...

Today, the industry which gave us assembly line mass production is producing a major share of the weapons that already are changing the shape of the world. And inseparably a part of this drama, which began with a piece of rope, is the machine tool engineering of a handful of basic machine tool companies.

One of these — Jones & Lamson — is the oldest machine tool company in America. Precision machine tools designed and developed by this company have helped to make possible every step in the development of modern assembly line technique. And today, Jones & Lamson engineers and service men are working right on the line in hundreds of plants, inside the world's greatest industry.

The knowledge and skill which this represents will be of value to you in meeting today's production problems, and in planning for tomorrow. They are yours for the asking now. Call upon us!

JONES & LAMSON
MACHINE COMPANY

Manufacturers of • Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies

Springfield, **Vermont, U. S. A.**

QUICK CONVENIENCE IN Checkin

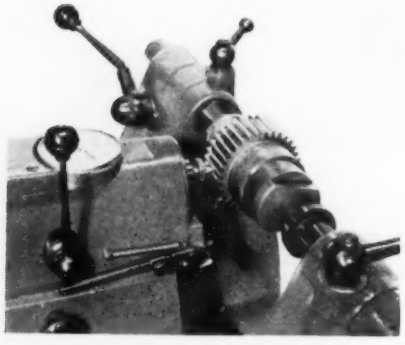
OF EXTERNAL SPUR AN

Fellows has designed this new Gear Testing Fixture to provide a simple and practical method for checking the circular pitch of external spur and helical gears.

A second measuring bracket may be substituted converting the device to a Cone-Point Testing Fixture for checking concentricity.

Either or both devices have a capacity for gears measuring not over 15 inches between centers, and up to 12 inches pitch diameter. Overall dimensions are 28 x 18 inches, and these devices are intended for either stand or bench use. Both fixtures are rigid, a highly desirable requirement for high-precision work.

For Circular Pitch Testing, the device, as illustrated at the right, is arranged to index the gear, tooth by



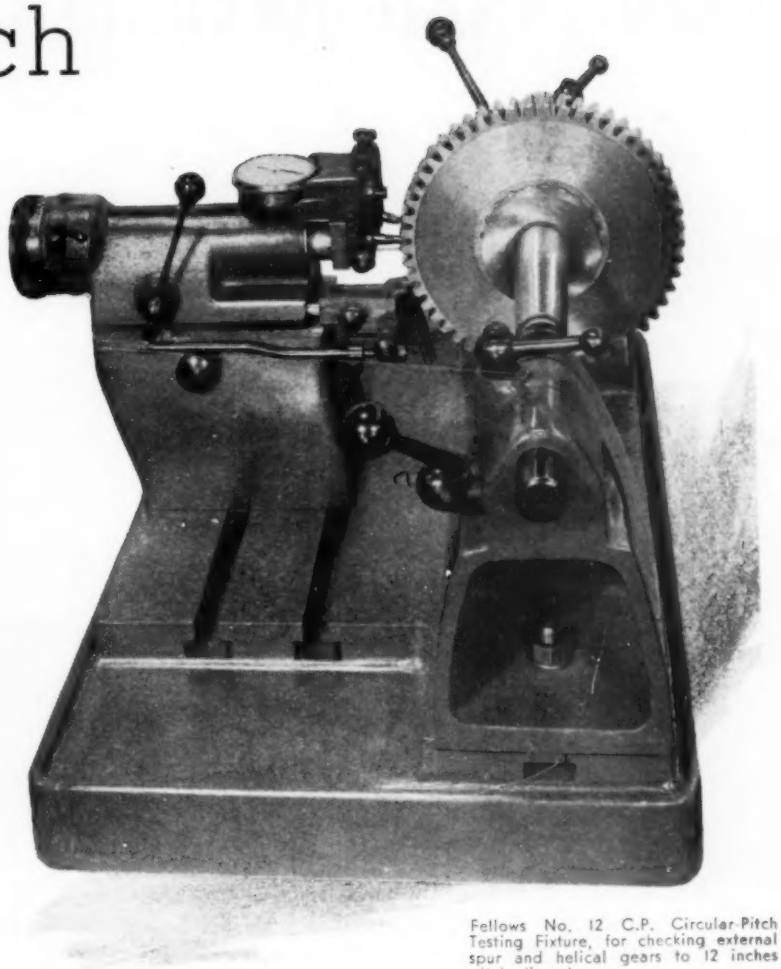
Fellows No. 12-C Cone-Point Testing Fixture, the measuring bracket on which can be interchanged with that on the Circular Pitch Testing Fixture.

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTIO

Circular Pitch

AND HELICAL GEARS



Fellows No. 12 C.P. Circular-Pitch Testing Fixture, for checking external spur and helical gears to 12 inches pitch diameter.

tooth, through a lever actuated mechanism easily set for each pitch. At each indexing a fixed finger and a spring locate the gear tooth while the measuring finger actuates the dial indicator.

Gear production and gear assembly departments alike will welcome these simple, convenient testing devices. For further particulars, write: The Fellows Gear Shaper Company, 78 River Street, Springfield, Vermont—640 West Town Office Building, Chicago, Illinois—616 Fisher Building, Detroit, Mich.

Method

. . . . FROM BLANK TO FINISHED GEAR

Quick Set-Up... Extreme Accuracy....

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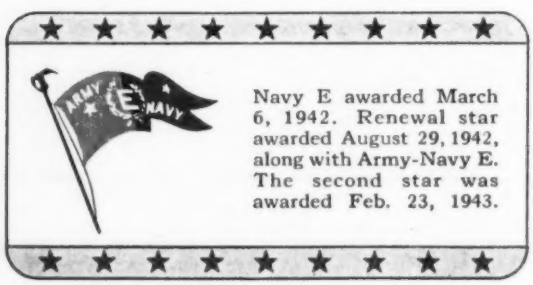
The extreme usefulness of CINCINNATI Hydraulic Universal Grinding Machines that give you Faster Set-Up, Faster Handling, Faster Grinding, Faster Sizing and extreme accuracy with practically no maintenance expense, is the result of the skill and wide experience of the engineers and technical experts here at Grinding Headquarters.

And whether it be centerless or center-type grinding, CINCINNATI Grinders are doing a bang-up production job that's causing no end of woe for our enemies. We shall be glad to submit many case histories of exceptional production records on a wide variety of work.

Look in Sweet's Catalog File for Mechanical Industries for brief description of all CINCINNATI Grinding Machines. Specification catalogs giving more detailed information are available for any machine in which you are interested. Write for your copy today.



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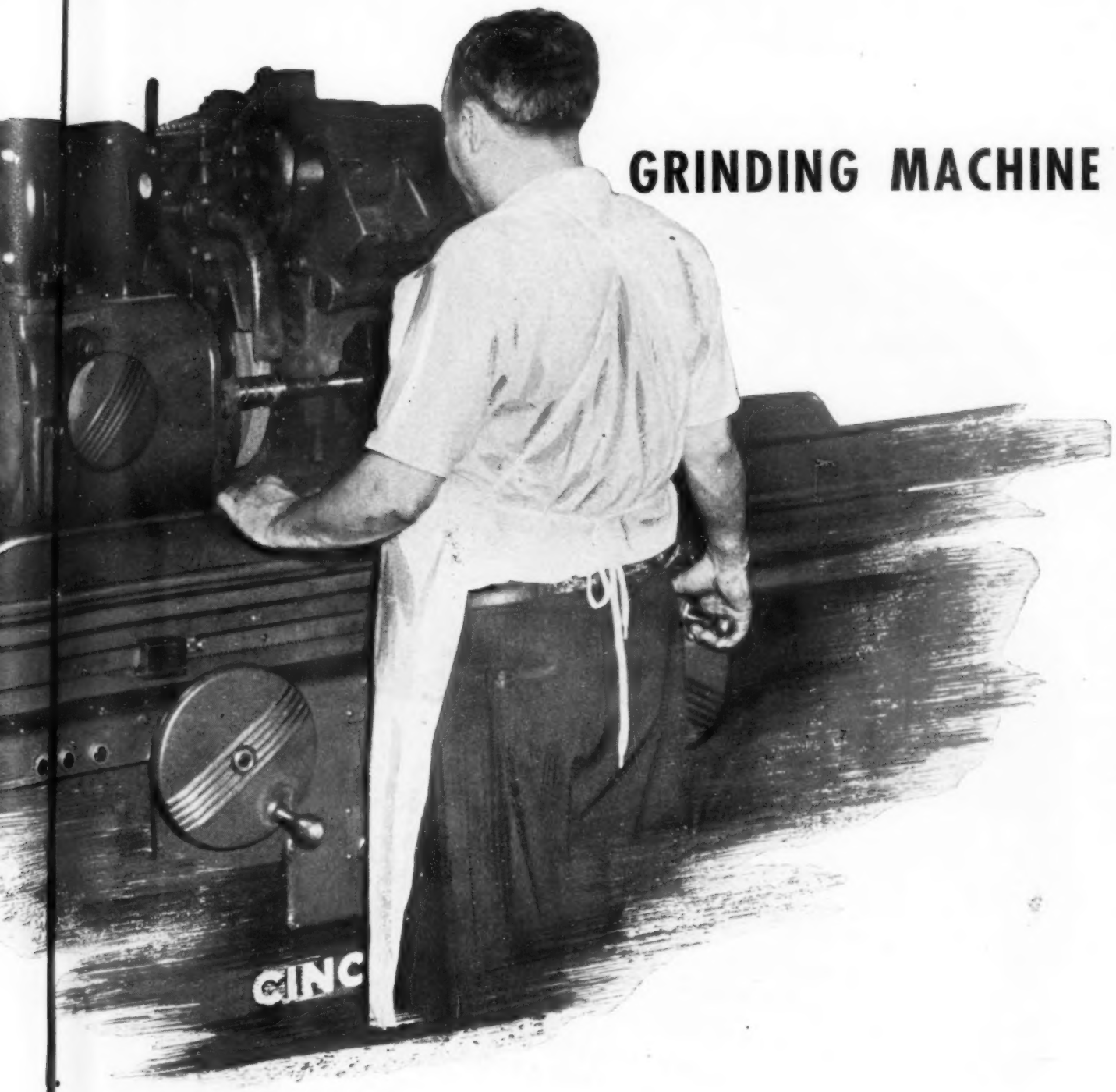
Fine Finishes .... Wide Variety of Work



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"Have You Investigated t

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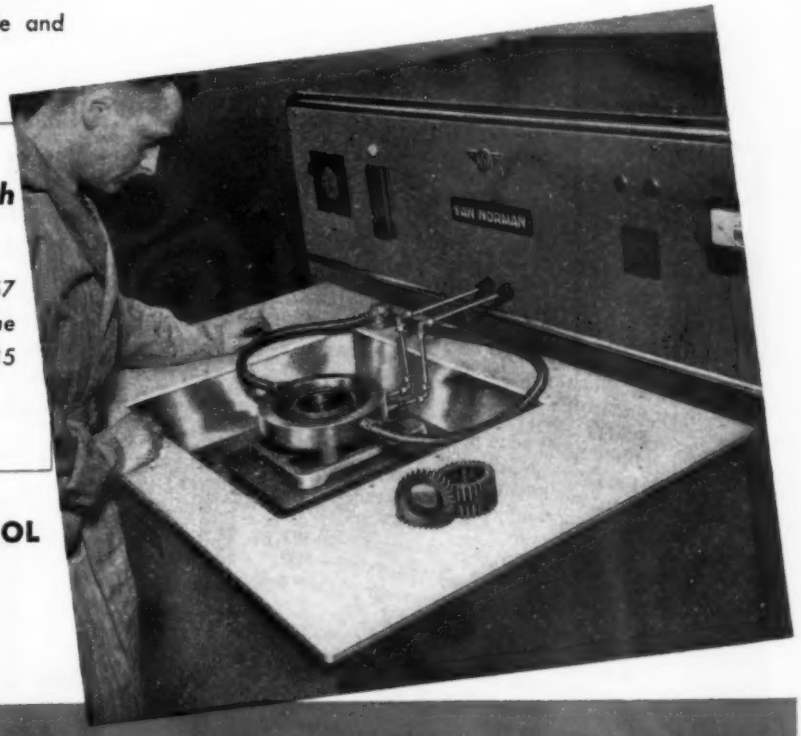
d the Possibilities of Van Norman HFIH?*"

(*HIGH FREQUENCY INDUCTION HEATING)

Because Van Norman High Frequency Induction Heating speeds up production, cuts costs, and provides a better finished product — more and more design engineers, production engineers and plant executives are turning to High Frequency Induction Heating for surface hardening, brazing, soldering, and a host of other heating applications. The reason . . . High Frequency Induction Heating provides quick, localized heat to a specific portion or area of metal. This not only simplifies heating operations but also saves considerable time. In fact, many heating jobs are completed in seconds as compared to hours when previous methods are used. In addition, warping, distortion, scale and straightening operation are minimized or entirely eliminated. And because the entire heating operation is automatic, Van Norman High Frequency Induction Heating eliminates chance of human error — thus part after part is turned out with identical characteristics. A typical surface hardening application is shown below.

Yes, you, too, can profit with HFIH. So investigate Van Norman High Frequency Induction Heating today. A complete story of their advantages, possibilities and applications will be sent on request. Write for your copy.



Surface Hardening Gear Teeth in 23 Seconds

Gear teeth are hardened to 55-57 Rockwell C in 15 seconds. Quench time is 8 seconds. Depth of hardening .035 to .045. Material-plain carbon steel.

VAN NORMAN MACHINE TOOL COMPANY

Springfield, Massachusetts

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LANDIS CHASERS Can Be Used For Both RIGHT and LEFT Hand Threading

12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

With Landis Tangential Chasers, Tool Inventories and Installation Costs Are Materially Reduced Since . . .

The same chasers may be employed for both right and left hand work merely by grinding the proper cutting angles at both ends of the chasers. For cutting left hand threads, use left hand chaser holders and reverse the action of the spring as illustrated above.

The Finest Thread Cutting Tool in Industry

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WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

LANDIS REG. U.S. TRADE MARK

THREAD TIPS

A Good Mechanic Knows and Cares For His Machine

In the Interest of Efficiency, Better Workmanship and Higher Production

FOR MAXIMUM CHASER LIFE AND BEST QUALITY OF THREAD FINISH, USE THE CORRECT CUTTING SPEED FOR THE MATERIAL BEING THREADED

LANDIS SYSTEM OF THREADING SPEEDS (F.P.M.)
NATIONAL FINE SERIES

	MATERIALS											
	TOOL STEEL (CARBON)		VANADIUM STEEL NICKEL STEEL FORGED STEEL OPEN HEARTH MONEL METAL		MACHINE STEEL DRAWN STEEL TOBIN BRONZE BESSEMER SCREW STOCK		MALLEABLE IRON CAST IRON		CAST BRASS BAR BRASS PHOS. BRONZE COPPER		FIBER BAKELITE ALUMINUM LEAD	
DIA.	R. P. M.	SURFACE SPEED	R. P. M.	SURFACE SPEED	R. P. M.	SURFACE SPEED	R. P. M.	SURFACE SPEED	R. P. M.	SURFACE SPEED	R. P. M.	SURFACE SPEED
1/4	382	25	611	40	764	50	917	60	1222	80	1222	80
5/16	306		489		611		733		978		978	
3/8	255		357	35	458	45	611		815		815	
7/16	175	20	306		393		524		656	75	699	
1/2	153		268		344		459		573		611	
9/16	136		238		306		373	55	475	70	543	
5/8	122		214		276		337		428		489	
3/4	92	18	153	30	203	40	254	50	357	65	381	75
7/8	79		131		153	35	219		285		329	
1	69		115		134		191		258		287	
1-1/8	61	15	85	25	119		153	45	204	60	255	70
1-1/4	46		76		107		137		183		214	
1-1/2	38		64		89		115		153		178	
1-3/4	33		44	20	66	30	87	40	120	55	153	
2	29		38		57		76		105		124	
2-1/4	20	12	25	15	42	25	59	35	85	50	111	65
2-1/2	18		23		38		54		76		99	
2-3/4	17		21		35		49		69		83	60
3	15		19		32		45		64		76	

CUTTING SPEEDS LISTED ARE FOR ANNEALED STOCK ONLY. WHEN HEAT TREATED MATERIAL IS THREADED DECREASE CUTTING SPEED 20 TO 30%.

Be Threadwise—Employ LANDIS Long Life Tangential Chasers

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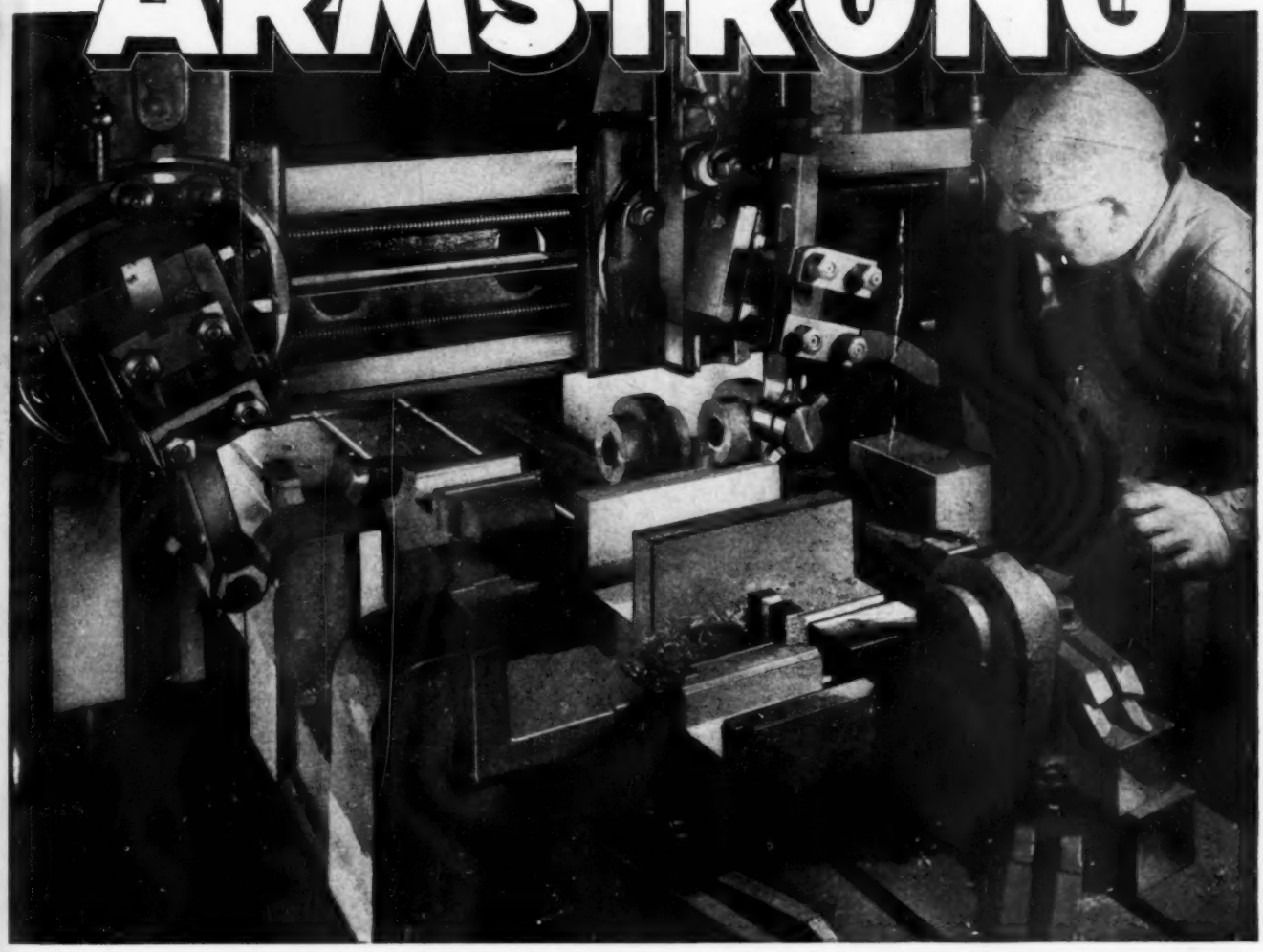
LATHES RADIALS SHAPERS

ARMSTRONG



Now is the time to tool up *permanently* . . . with ARMSTRONG TOOL HOLDERS

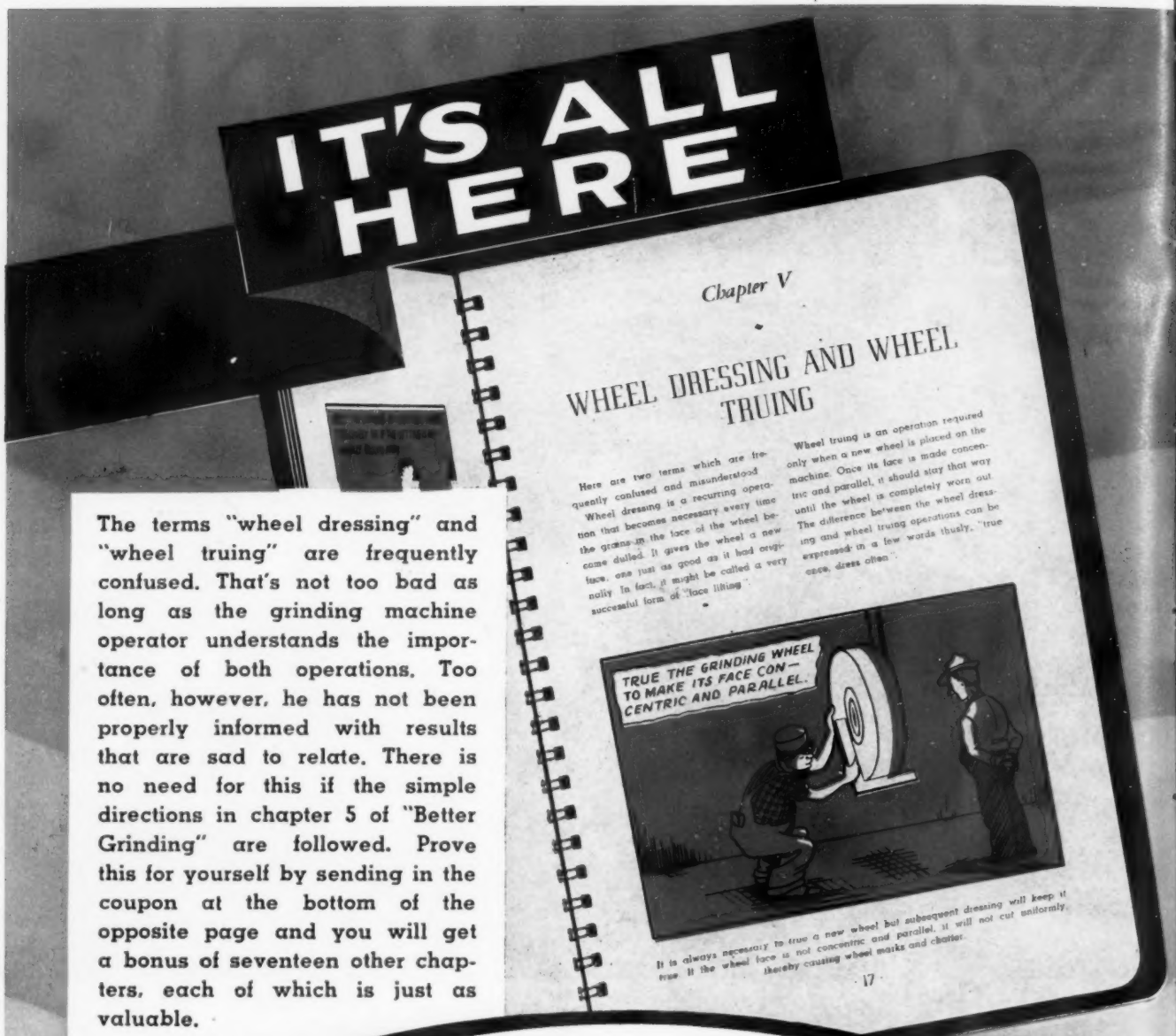
Because ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds and "Save: All Forging, 70% Grinding and 90% High Speed Steel", they can answer many of your most serious war time problems. Not only do they eliminate "tool dressing", and delays in "tooling-up" and make high speed steel go 10 times as far, they also can greatly increase the hourly output of lathes, planers, slotters and shapers, because they have strength to stand up to greatly increased speeds and feeds—cut efficiently at speeds often double ordinary "standard" cutting speeds. They also enable "apprentices" and less skilled workers to do a greater number of operations because they take cutters any machinist can quickly grind from stock shapes of high speed steel, and hold them at the correct cutting angle, at the proper tool approach and give maximum tool clearance for each operation.

Now is no time to "limp along" or "get by" with tool holders designed for other operations. Equip each lathe, planer and shaper with its complement of ARMSTRONG TOOL HOLDERS. Then you will be tooled-up not only for today's wartime work but tomorrow's peacetime job as well because each ARMSTRONG TOOL HOLDER is a multi-purpose tool that does the work of a complete set of forged tools, and each is a permanent tool that will give many, many years of efficient service.

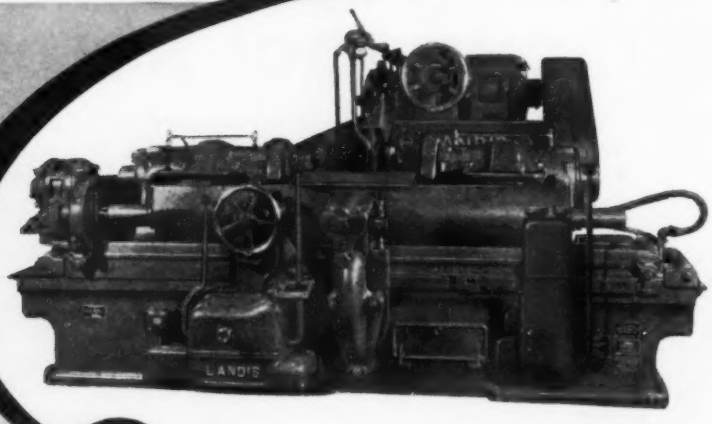
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago, U.S.A.
Eastern Warehouse & Sales: 199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

IT'S ALL HERE


Chapter V
WHEEL DRESSING AND WHEEL TRUING
Here are two terms which are frequently confused and misunderstood. Wheel dressing is a recurring operation that becomes necessary every time the grains in the face of the wheel become dulled. It gives the wheel a new face, one just as good as it had originally. In fact, it might be called a very successful form of "face lifting."
Wheel truing is an operation required only when a new wheel is placed on the machine. Once its face is made concentric and parallel, it should stay that way until the wheel is completely worn out. The difference between the wheel dressing and wheel truing operations can be expressed in a few words thusly, "true once, dress often."
TRUE THE GRINDING WHEEL TO MAKE ITS FACE CONCENTRIC AND PARALLEL.
It is always necessary to true a new wheel but subsequent dressing will keep it true. If the wheel face is not concentric and parallel, it will not cut uniformly, thereby causing wheel marks and chatter.
17

The terms "wheel dressing" and "wheel truing" are frequently confused. That's not too bad as long as the grinding machine operator understands the importance of both operations. Too often, however, he has not been properly informed with results that are sad to relate. There is no need for this if the simple directions in chapter 5 of "Better Grinding" are followed. Prove this for yourself by sending in the coupon at the bottom of the opposite page and you will get a bonus of seventeen other chapters, each of which is just as valuable.



THE LANDIS 16" - 25" TYPE D HYDRAULIC CRANK PIN GRINDERS

- **Recommended for grinding the crank pins of automobile, airplane and small Diesel engine crankshafts.**
- **Used by numerous war industries, chief of which is the airplane industry which requires large amounts of such equipment for handling airplane crankshafts.**
- **Available in 16" and 25" swings and in 32", 42" and 72" lengths.**

IF YOU HAVE A GRINDING PROBLEM

Let George do it

LANDIS TOOL COMPANY

George Grindit Says
"Any man feels better dressed if his face is smooth. Not so with a grinding wheel. It's well dressed when its face is sharp and gets as contrary as a mule if you don't keep it sharp. Like it or not, a grinding wheel face needs just as much care and attention as your very own (or the little lady's)."
PRECISION
LANDIS
GRINDERS

THE CHAPTERS

Work Centers and Centers in the Work . . Work Drivers and Driving Dogs . . Work Rests . . The Diamond . . Wheel Dressing and Wheel Truing . . Mounting and Balancing the Wheel . . Grinding Wheel Coolant . . Lubrication . . Multiple V Belt Drives . . Wheel Spindles and Bearings . . Grinding Wheel Feed . . Grinding Wheel Width . . Speed of Work Carriage Traversal . . Work Speed . . Grinding Wheel Speed . . The Grinding Wheel . . Chatter . . Miscellaneous Bits.

Please Send Me a Free Copy of . . .

"BETTER GRINDING"

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ 5

Please Print Above and Send To

LANDIS TOOL CO.

WAYNESBORO, PENNSYLVANIA

WAYNESBORO, PENNSYLVANIA

"BACKBONE" GIVES THE MILWAUKEE ACCURACY AND PERFORMING POWER

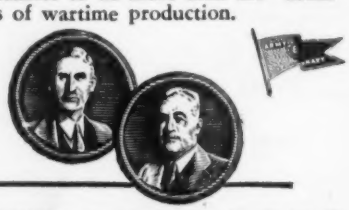
Air attack! Instantly the antiaircraft guns spring into action — pumping shells into the sky —spreading dense clouds of destructive "flak" for enemy planes. AA guns need plenty of "backbone" to hurl tons of metal to flying levels overhead.

Milling tough metals and alloys at high speeds and to close tolerances, hour after hour, isn't quite as spectacular, but the machine that handles the work must have similar backbone to withstand the ceaseless strain and vibration.

In milling machines — *rigidity* — an indispensable quality in any machine tool — originates in the column, the backbone of the machine. The column of the Milwaukee Vertical Milling Machine is engineered for the proper distribution of metal to provide a backbone that holds vibration to the minimum.

The solid column back — the small openings in its neutral axis exemplify correct engineering in every detail.

It is features like this which have enabled Milwaukee Milling Machines to do more than the "usual" under the stress of wartime production.



KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WISCONSIN

Buy Victory with at least 10% in War Bonds!

Milwaukee MACHINE TOOLS

18 CAM MILLING METHODS

Let's Put The Scrap Into The *Scrap!*

Turnings, clippings, short ends, worn out or broken tools — all these are valuable as precious scrap for remelting in the production of new steel. Surprising amounts of dormant scrap accumulate in every plant daily — collect it — segregate it. Set up a system for the regular pick-up and handling of this valuable raw material. Remember, it's a war on waste, too, and every bit of scrap *collected* counts in production for Victory.

. . . Described and Explained in this Kearney & Trecker Corporation Bulletin

Machining and milling cams of various types present special problems. This series of articles, reprinted from American Machinist in bulletin form, explains methods of cam milling from the practical shopman's viewpoint.

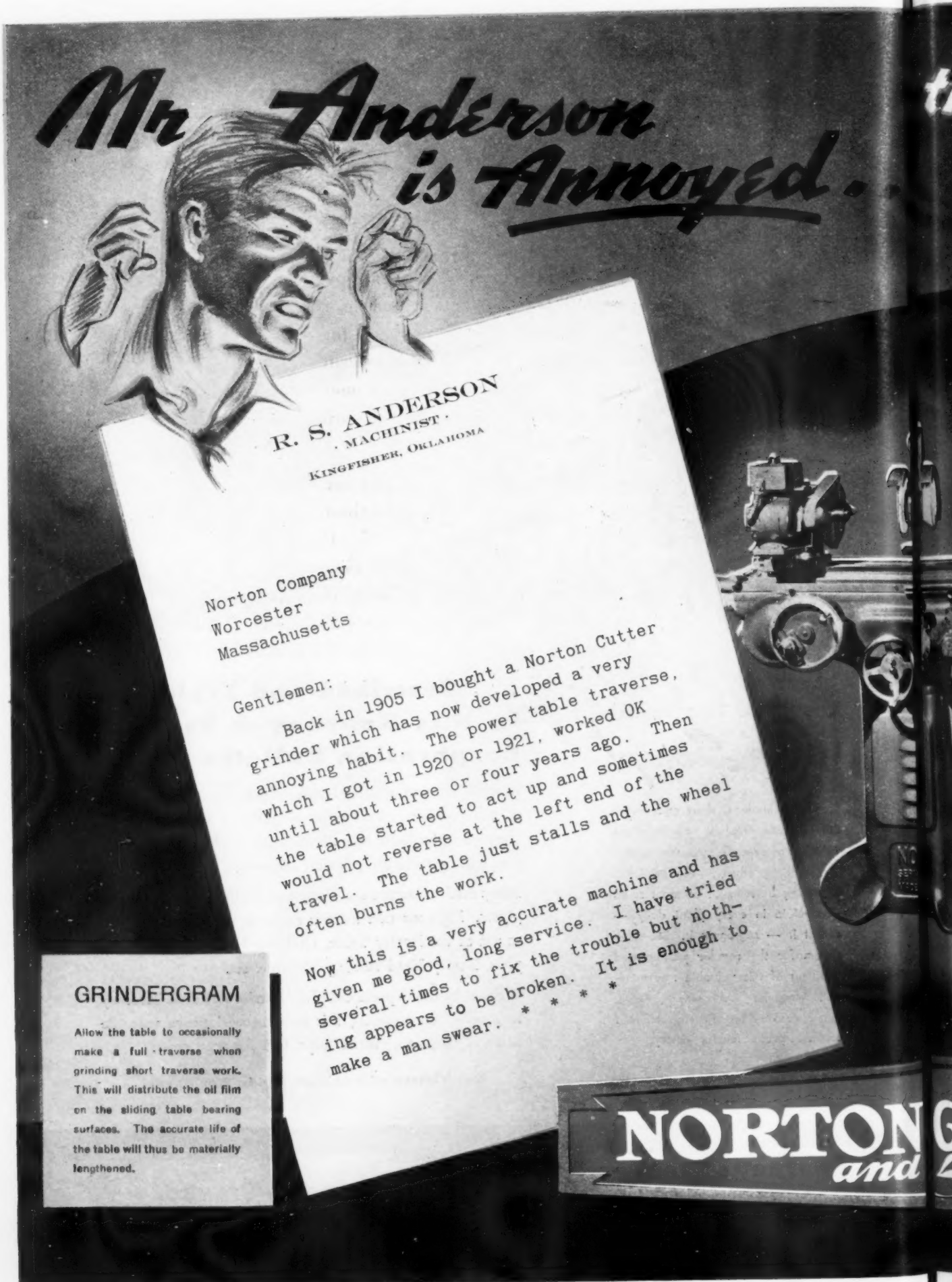
Many machine setups are illustrated, including working diagrams. Eighteen cam milling methods are described, such as use of the Rotary Table, Dividing Head, Dummy Templets, Rotary Head Milling Machine, etc.

Written by the department of Industrial Research, Kearney & Trecker Corporation, this bulletin will prove valuable to every shopman. Write Dept. CM for your copy.

Buy Victory with at least 10% in War Bonds!

Kearney & Trecker *Products* CORPORATION
MILWAUKEE, WISCONSIN
Subsidiary of Kearney & Trecker Corporation

Kearney & Trecker CORPORATION
Milwaukee, Wisconsin


Mr Anderson is Annoyed . . .
R. S. ANDERSON
· MACHINIST ·
KINGFISHER, OKLAHOMA
Norton Company
Worcester
Massachusetts
Gentlemen:
Back in 1905 I bought a Norton Cutter grinder which has now developed a very annoying habit. The power table traverse, which I got in 1920 or 1921, worked OK until about three or four years ago. Then the table started to act up and sometimes would not reverse at the left end of the travel. The table just stalls and the wheel often burns the work.
Now this is a very accurate machine and has given me good, long service. I have tried several times to fix the trouble but nothing appears to be broken. It is enough to make a man swear. * * * *
GRINDERGRAM
Allow the table to occasionally make a full traverse when grinding short traverse work. This will distribute the oil film on the sliding table bearing surfaces. The accurate life of the table will thus be materially lengthened.
NORTON
and

the NORTON "doctor" PRESCRIBES 2 New Springs

MR. ANDERSON may well be annoyed but we say he waited *too long* before calling for help. Norton Grinding Engineers, always on tap for consultation, tell us that Mr. Anderson, in those pestering years of fighting a balky reverse action, overlooked one factor, the fatigue of metals, and that the left reverse spring in his grinder is "just plumb tired out."

Possibly *you have* a Norton grinding machine that is balky and makes you cuss, especially in these days when every minute, every machine hour counts. If so, don't hesitate to tell us your troubles. Norton Grinding Engineers—often from information in a clear, concise letter—can make gratifying recommendations for changes in technique, machine adjustment or parts replacement. Call on them.

P.S. Two new, matched-tension reverse springs have put Mr. Anderson in good humor again.

NORTON COMPANY, WORCESTER, MASS.

M-457

Left: The 1943 Norton No. 2 Tool and Cutter Grinder with Hydraulic Traverse

N GRINDERS
d Lappers

The creature no one knows...

IN THE HALF-WORLD between day and night, an eerie, sinister creature emerges from hiding. Its ancestry is unknown. It is the bat, the only mammal which flies. Of all the creatures known to man, bats are the most mysterious. They do not mate when other animals do. And no one knows where they go at migration time.

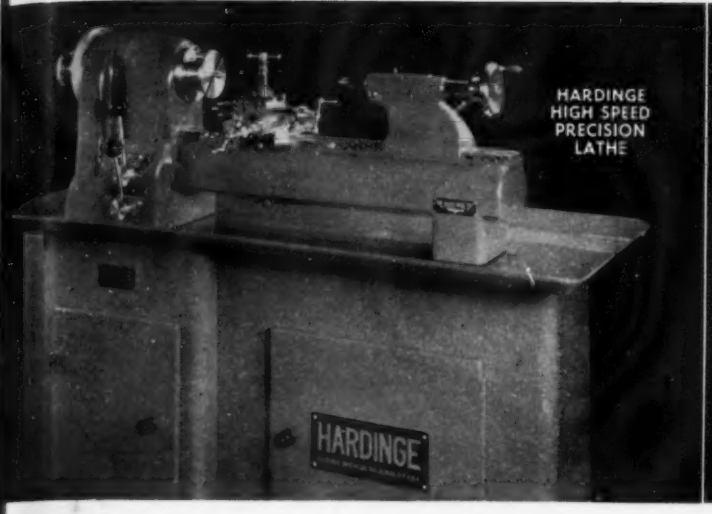
Yet bats are the most highly specialized mammals on earth. If we had the intricate ears of bats, we could hear an ant walking. If we had their incredible coordination, we could fly at the speed of a locomotive toward a telephone wire...at dusk...yet miss it! Or dash blindfold around hundreds of objects and not touch one!

But if you think **that's** specialization, listen to this: The production giant of the machine tool industry—Cone's multiple spindle automatic lathe—can do as many as 8 different jobs simultaneously...in a matter of seconds...or perform as many as 17 different operations on a part—more than one every two seconds—with the deftness of a master craftsman!

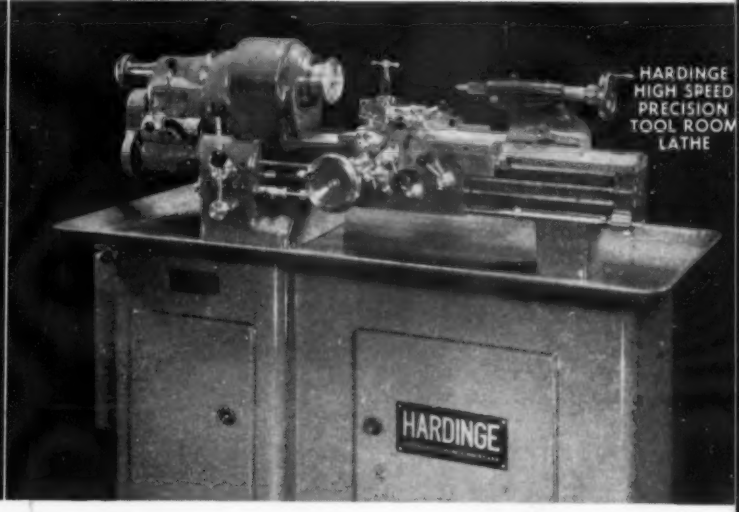
The prime task of Cone Automatic Machines today is to help speed war production. In the future, by making possible increased production, they will increase purchasing power...and so increase employment. As a result, Cone Automatics will make major contributions to social and economic gains of the future.

CONE Automatic Machine Company, Inc., Windsor, Vermont

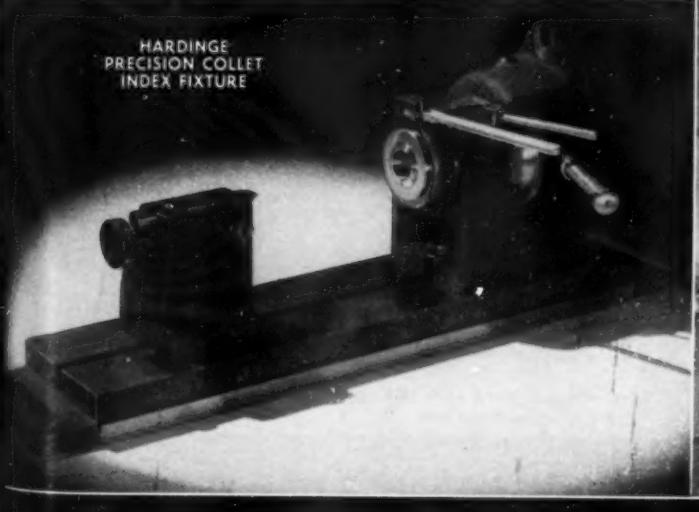
HARDINGE



Performance has established leadership



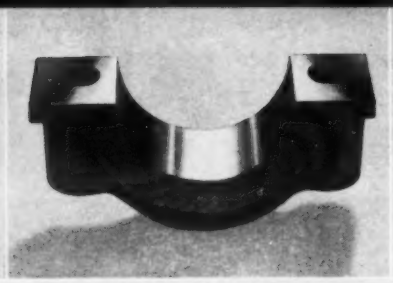
for HARDINGE Precision Equipment



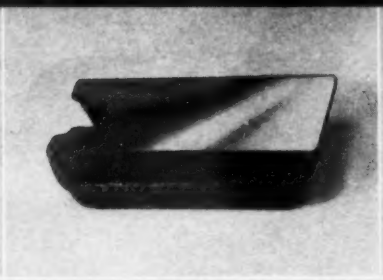
HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

mits held very close in surface oaching contact surface of bearing.

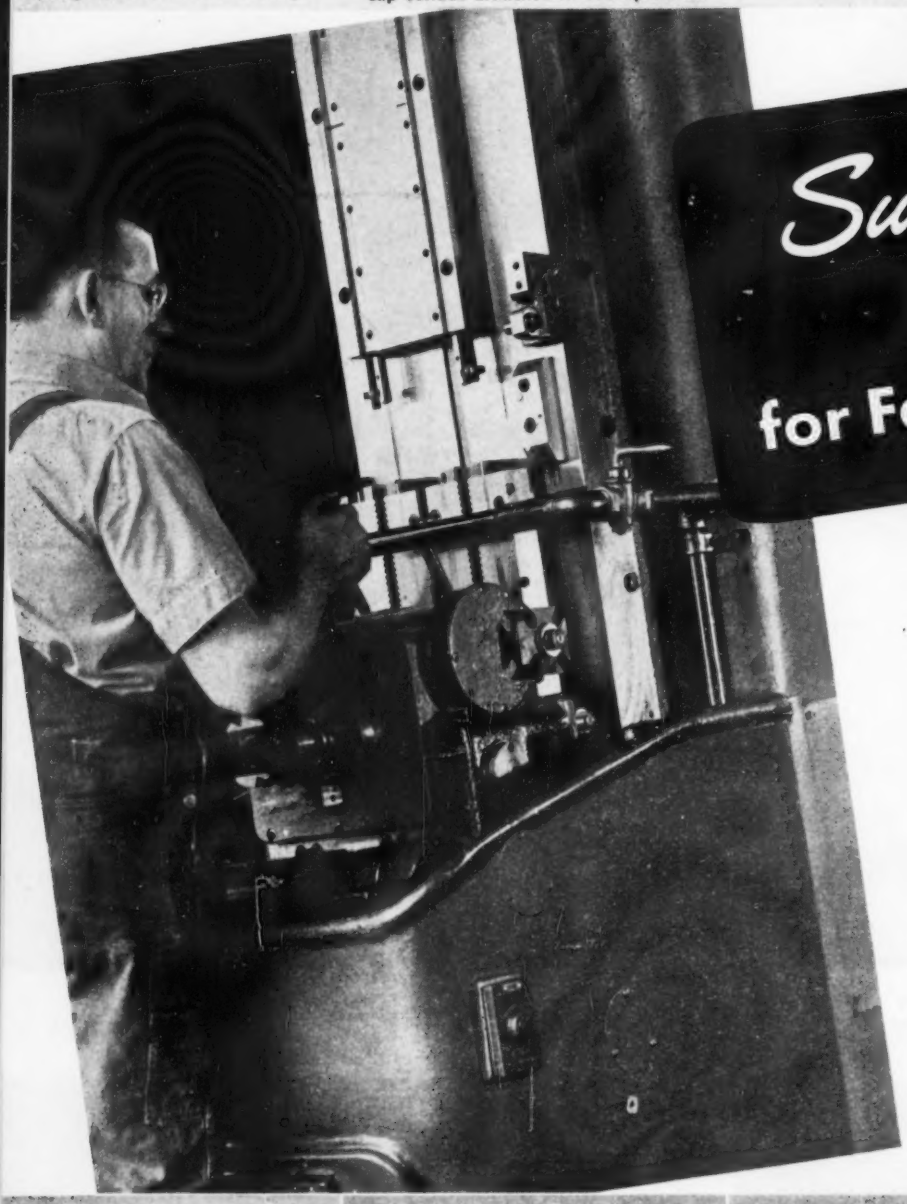


Contact faces and half-round of bearing cap surface broached in one operation.



Flat surface broached on cast iron piece.

Hexagon sides broached in one p of broach with indexing fixture



Surface Broaching for Faster Machining

Footburt Surface Broaching Machines have been showing remarkable saving on many war contracts; through faster production per man and in tool maintenance costs. Many jobs that were slow and expensive when handled by conventional machining methods are now being surface broached on Footburt machines. Production in most cases is as fast as the speed at which parts can be loaded, yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.

THE FOOTE-BURT COMPANY
CLEVELAND, OHIO
Detroit Office: General Motors Building

Broaching squares on each end of steel piece using indexing fixture.

Rough broaching of bevel gear teeth handled with automatic indexing fixtures.

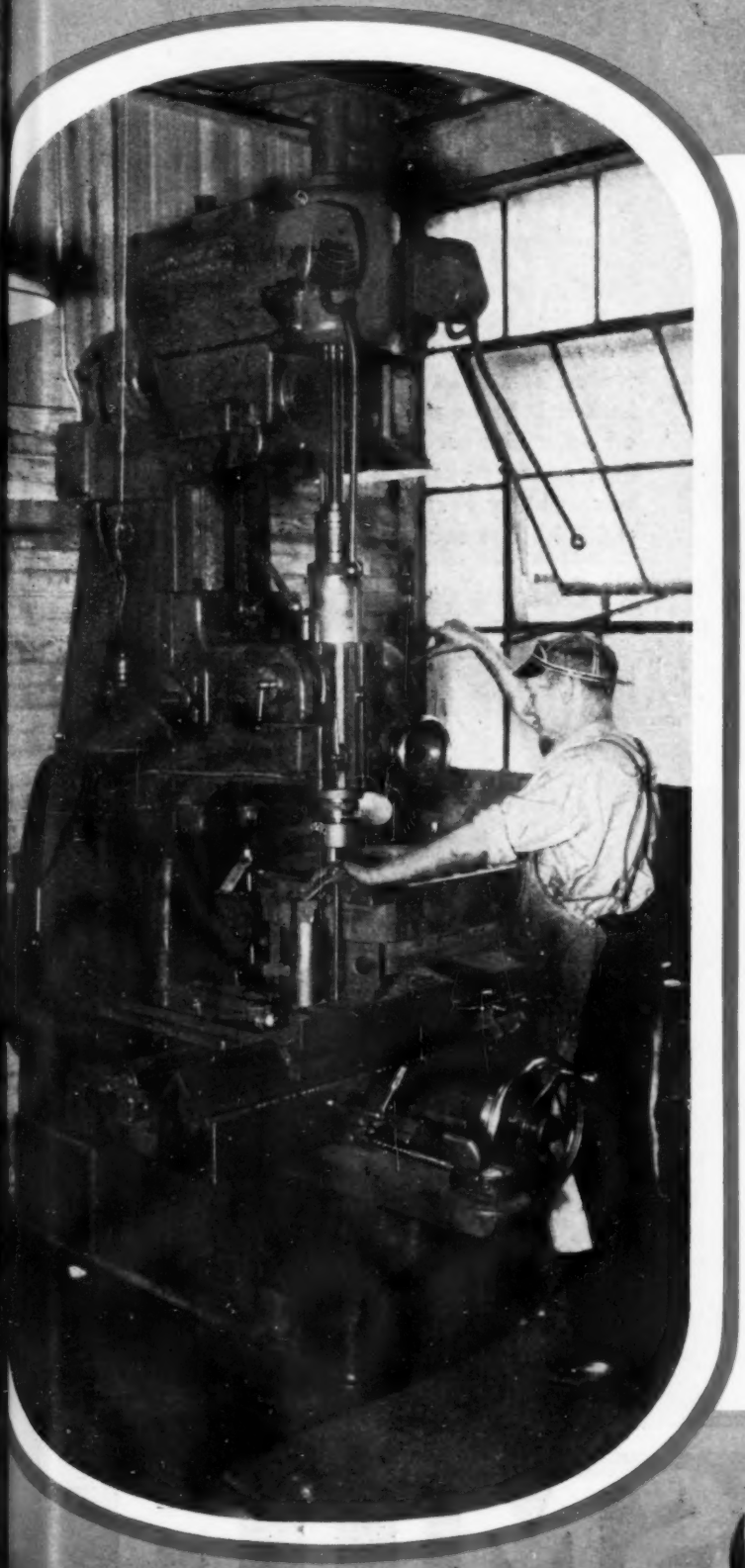
Deep slot combined with side cut on small brass part.

Teeth broached on pipe wrench j similar operation used on plier

FOOTBURT Surface BROACHING

FOSDICK

JIG BORER



combines flexibility and accuracy on a wide range of operations

ARMY E NAVY

● The flexibility of this machine comes from practical design and construction which provides exceptional ease of set up and quick change over from one job to another.

Simplicity of operation makes it easy for ordinary shop labor to obtain particularly close tolerance work without special training.

Being used extensively in Tool & Die Shops throughout the nation Fosdick Jig Borers are meeting the needs of precision production of tools—dies—and jigs so essential to our war program.

For the tool room—for the production shop—this machine is adaptable to both types of operation and requires only a moderate investment.

Thus the Fosdick Jig Borer offers the utmost in versatility plus dependable accuracy on both small lots and quantity production. Fosdick Jig Borers are helping to meet rigid production schedules in hundreds of War plants and at costs that are surprisingly low.

Put your next jig borer job on a Fosdick—for speed—for precision and for economy.

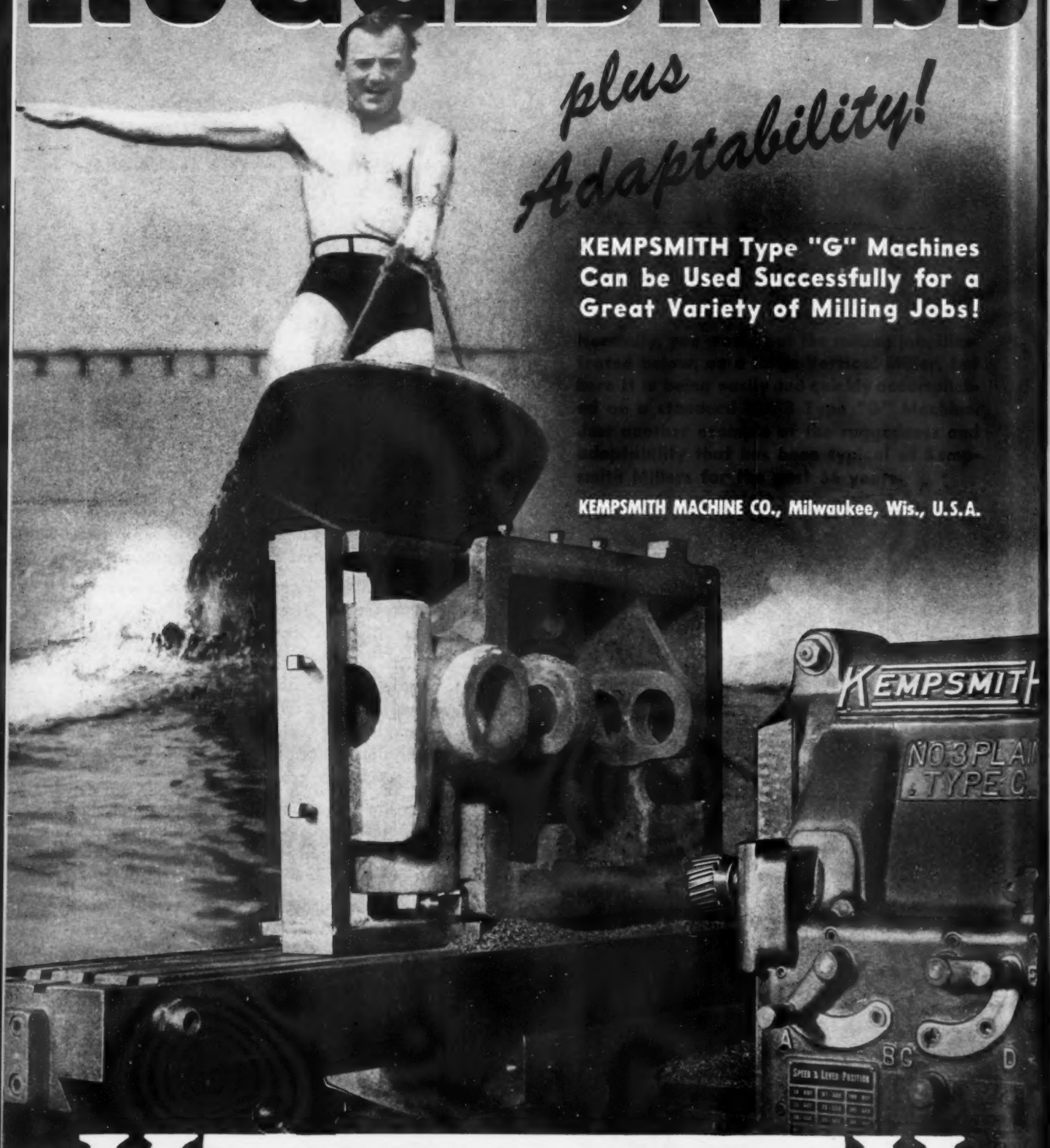
THE MANY ADVANTAGES and mechanical details of Fosdick Jig Borers are fully explained in our bulletin J.B.A. *Write for a copy. No obligation.*

FOSDICK MACHINE TOOL COMPANY

RUGGEDNESS

plus Adaptability!

KEMPSMITH Type "G" Machines Can be Used Successfully for a Great Variety of Milling Jobs!



KEMPSMITH MACHINE CO., Milwaukee, Wis., U.S.A.

KEMPSMITH

FOR "PROOF OF THE PUDDING"

Ask a User about MID-WEST *Abrasives*

We claim MID-WEST abrasive products—honing and superfinishing stones, grinding wheels, sandpapers and lapping bricks — are the world's *most efficient* abrasives.

But we don't ask you to take *our* word for it. Instead, we prefer that you ASK A USER. Just ask any user why he prefers MID-WEST abrasives. He'll tell you they do their work faster, they last longer and they produce better finishes. That is another way of saying they are more economical, they increase production and they eliminate rejects.

MID-WEST honing and superfinishing stones, for instance, are made with MICRO BOND, a remarkable new abrasive developed by MID-WEST engineers, that positively insures uniformity of quality and performance. The MID-WEST manufacturing process provides precise control of grain and grade. MID-WEST stones are tailor-made stones—tailor-made for specific finishing jobs. That's why we say: ASK A USER!

If you have a superfinishing, honing or grinding problem in your plant let one of our service engineers solve it for you. One of them is as close to you as your nearest telephone.

Use our FREE flatness and surface finish measuring service. Send in your part. We'll return it along with our report on its flatness or surface finish. Ask for further details.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE — DETROIT, MICHIGAN

Mid-West

- ★ *Honing Stones*
- ★ *Superfinishing Stones*
- ★ *Grinding Wheels*
- ★ *Emery Cloth*
- ★ *Sandpaper*

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit, Michigan

Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

*Name*_____

*Company*_____

*Address*_____

For Precision and Versatility

SIDNEY TOOL ROOM LATHES

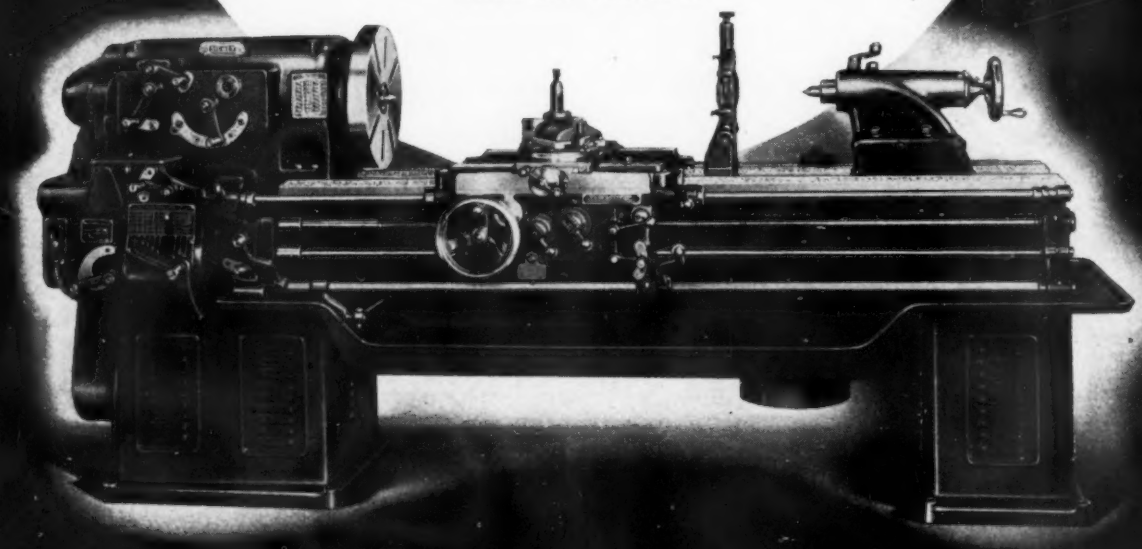
SIDNEY

● The wide range of work—the extreme tolerances demanded—the fine finish required in tool room operation finds hundreds of shops using Sidney Tool Room Lathes for this exacting work.

Sidney Tool Room Lathes are built in four sizes—from 14″ to 20″ inclusive. They have 16 speed continuous tooth Herringbone geared headstocks—48 feed changes from .0027″ to .172″—48 thread changes 1½ to 92—forced feed lubrication—anti-friction bearings throughout, all of which contributes to their wide range adaptability and long lived accuracy.

Built to rigid standards of Precision Accuracy.

Bulletins available.

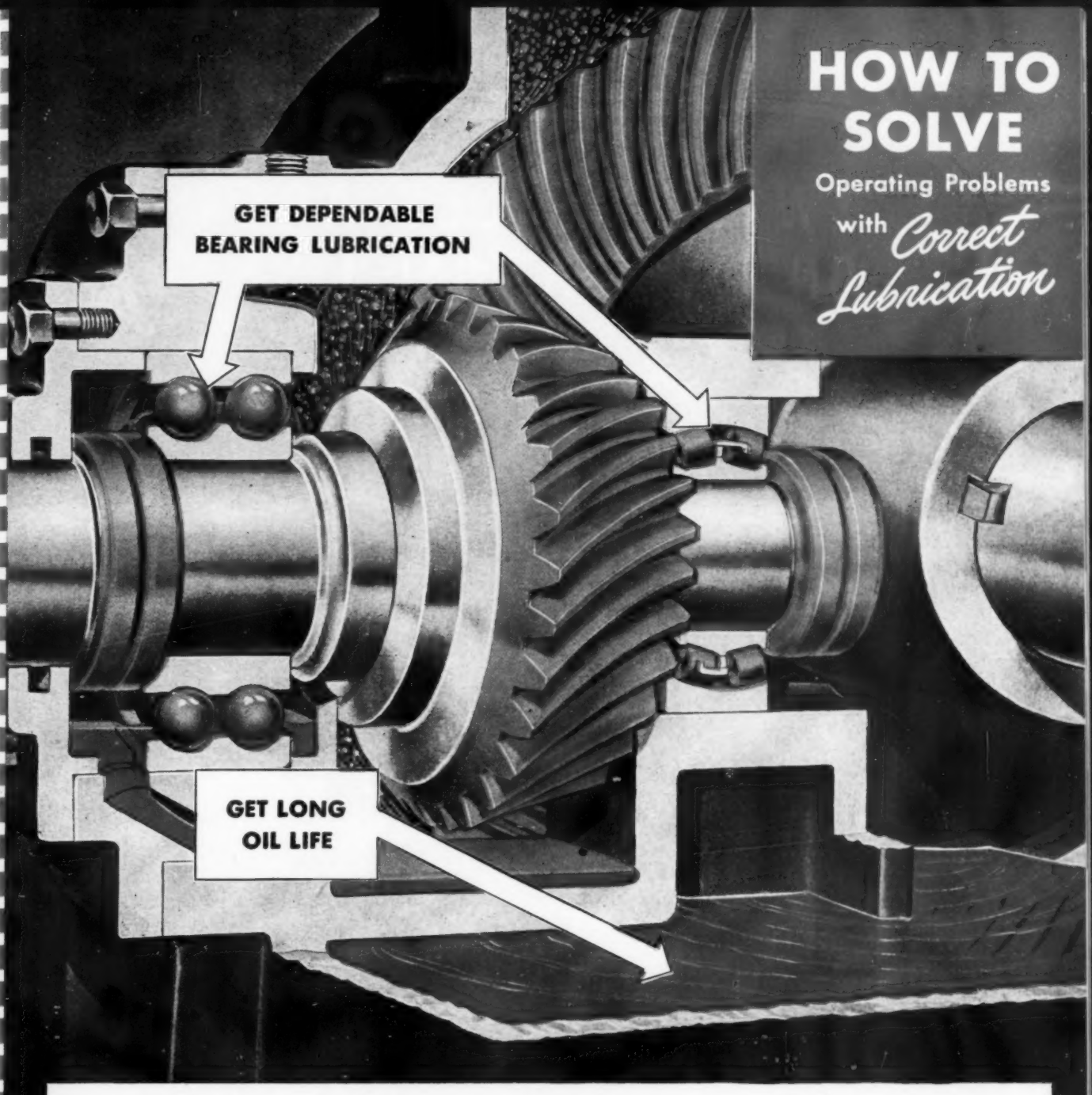


The **SIDNEY MACHINE TOOL** *Company*

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION



HOW TO SOLVE

Operating Problems with *Correct Lubrication*

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

Reduce Wear_Get a *Plus*, too

OF COURSE YOU WANT gear tooth wear kept to a minimum! Gargoyle Vacuoline Oil will help you do that in a splash or circulation oiling system. It forms an oil film of high lubricity and great strength.

But can you get more, too? What about the LIFE OF THE OIL? Does the oil you use separate easily from water? Is it free from emulsions and sludge? WHAT ABOUT THE BEARINGS? Does the oil you use protect them from damaging rust?

Here's the point: Gargoyle Vacuoline Oil does not only minimize wear. *It also minimizes rusting danger* in the bearings. *And it lasts long.*

Yes, by all means, *insist* on an oil that reduces tooth wear—but get the "plus" of long bearing life, long oil life by using Gargoyle Vacuoline Oil.

GARGOYLE
Lubricants

SOCONY-VACUUM OIL COMPANY, INC. — Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Magnolia Petroleum Company • General Petroleum Corporation of California

CALL IN SOCONY-VACUUM

TWIST DRILLS ARE ON THE CRITICAL LIST

THEY LAST LONGER WHEN GROUND ON THE COVEL *Yankee!*

DRILLS are hard to get and it's of utmost importance that you get maximum results from those you now have. Properly ground drills require less frequent sharpening, are longer-lived, produce more accurate work, reduce reamer costs and tap breakage, increase production. That's why every up-to-the-minute tool room depends on Covel Yankee Twist Drill Grinders to keep drills in A-1 condition for today's high-speed production . . .

Write, wire or phone today for Bulletin A103 and name of nearest dealer.

QUICK SET-UP saves hours of time in grinding a wide variety of drill sizes and lengths. Operator changes from one drill size to another almost without interruption.

SHORTEN EMPLOYEE TRAINING TIME WITH COVEL EQUIPMENT

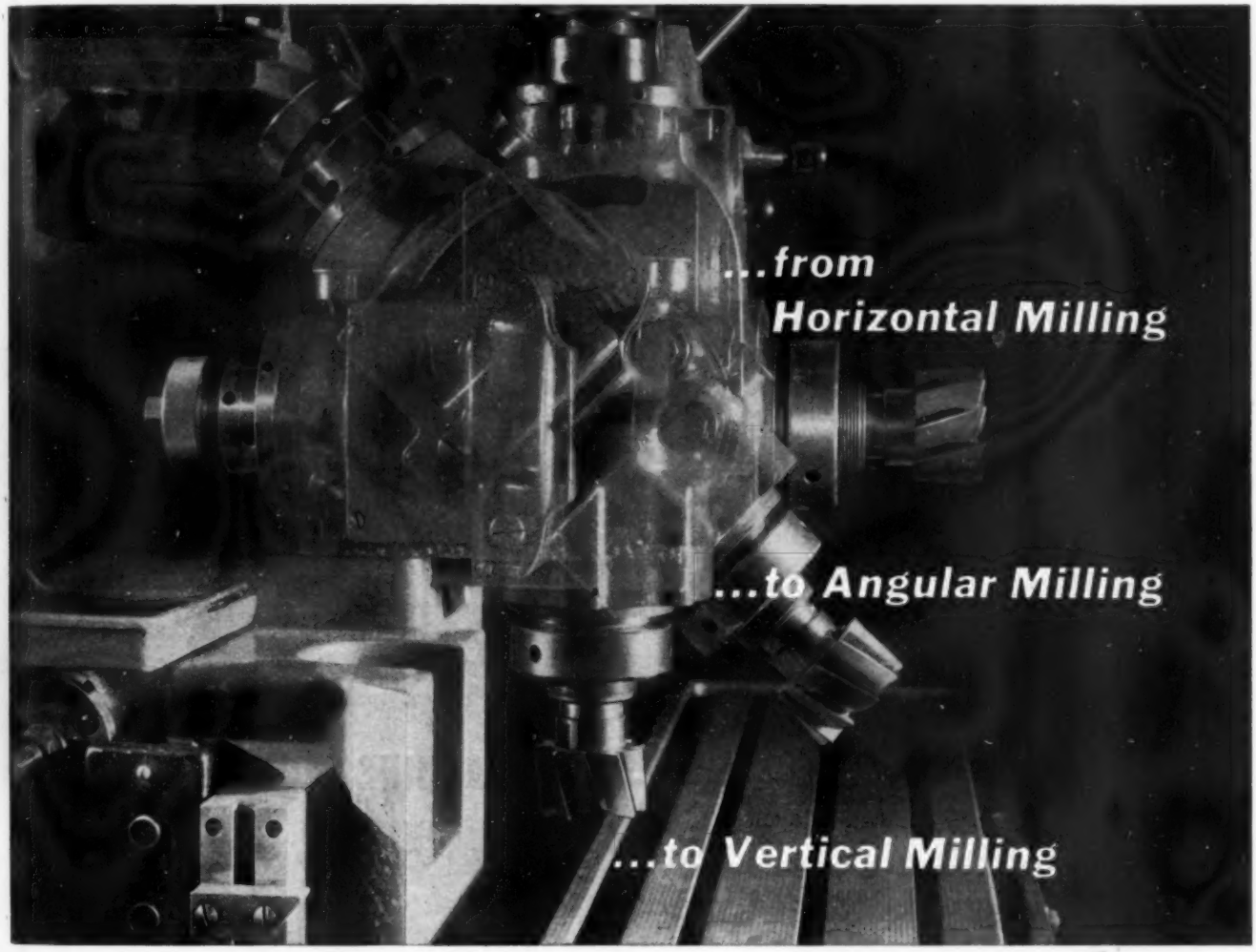
Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.

Quick Changes on Van Norman

RAM-TYPE MILLING MACHINES



When the operator has completed a horizontal cut on a Van Norman Ram-Type Miller, and wishes to proceed to an angular or vertical cut . . . *he does not need to touch the set-up on the table.* All he has to do is unclamp the swiveling cutterhead, swing it to the required position, reclamp . . . *and start the next cut.* Only a matter of moments, compared with the time needed to reset the work. And one of the greatest sources of errors is completely avoided. This exceptional ease and convenience of operation provide gains in time, accuracy and output. So today, throughout America's war industries, Van Norman Ram-Type Millers are delivering the goods in great plenty . . . and in plenty of time.

VAN NORMAN
Machine Tool Company
SPRINGFIELD, MASSACHUSETTS

ARMY E NAVY

In June, 1942, Van Norman was awarded the Army and Navy E in recognition of its war production record

MUNITIONS MANUFACTURERS

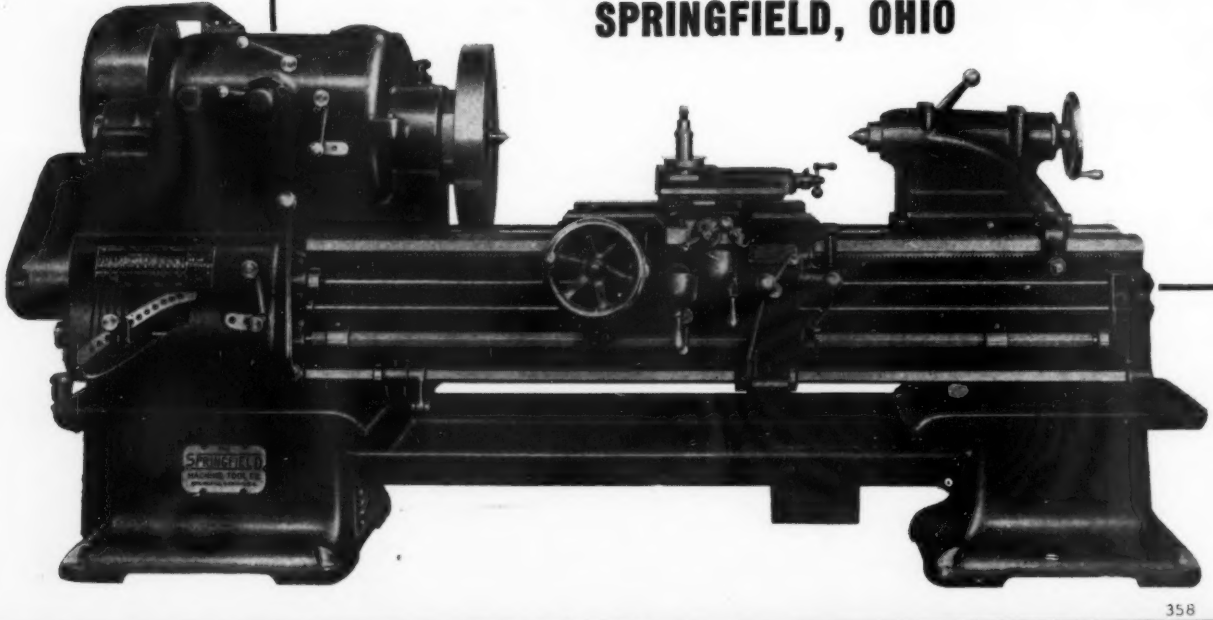
...LOOK TO SPRINGFIELD PRECISION LATHES!

. . . here is a lathe which is truly modern from headstock to tailstock. Features which are especially timely, mark it as an outstanding value for both tool room and quantity production use. Primary among these features—one that assures accuracy, and therefore is of great importance to munitions manufacturers—is MATERIALS.

Springfield Lathe beds are made in our own foundry—of highest nickel-chrome gray iron—an operation that enables us to *guarantee* strength and wear-resisting qualities . . . allows us to follow through on each casting operation . . . makes *certain* every rigid standard we specify. Springfield iron itself, too, is especially resistant to warping and marring, even under severest service. Here, then, are factors that account for the sustaining, over long periods of use, of the original accuracies built into every Springfield Lathe.

SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD, OHIO



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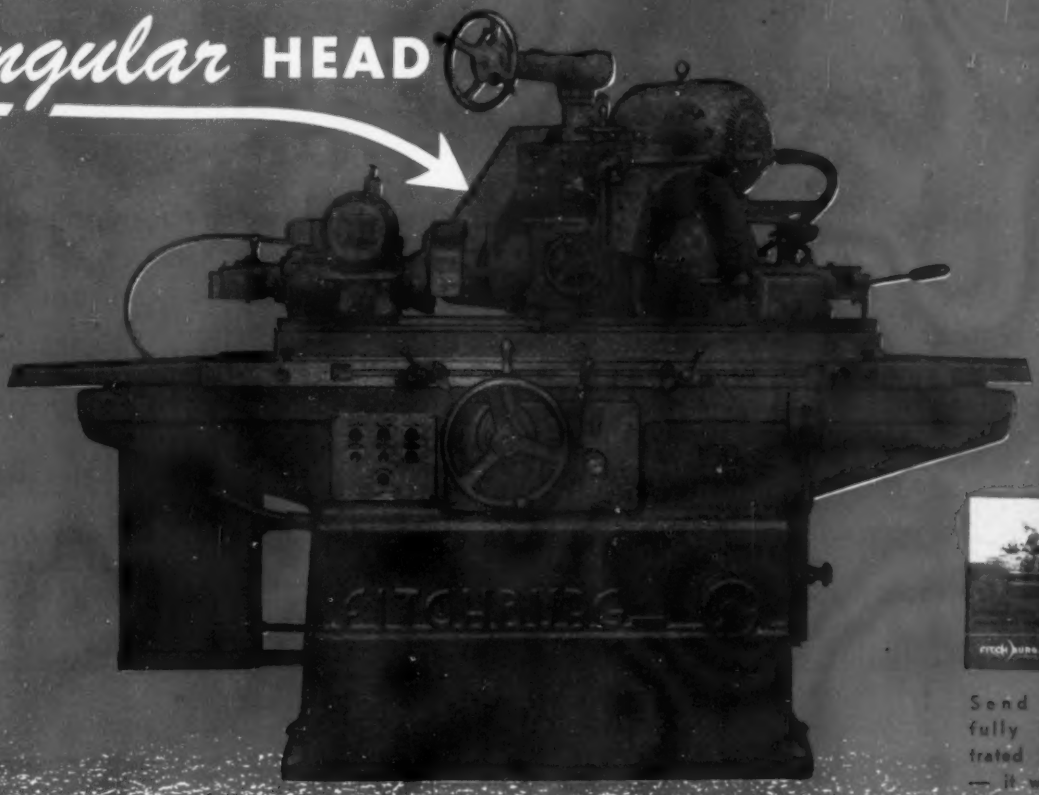
Retooling, especially for munitions manufacturers, should take into consideration (1) extreme ACCURACY and (2) maintenance of such accuracy. In other words, LONG LIFE. And the Springfield Lathe delivers both!

A GENERAL PURPOSE CYLINDRICAL GRINDER WITH ADJUSTABLE *Angular* HEAD



Send for fully illustrated folder — it will be mailed free.

This latest of Fitchburg plain cylindrical grinders, the Type "C" Angular Head Grinder, is designed to handle a wide range, and a number of types of jobs. It will cut grinding time and grinding costs.

The Fitchburg Type "C" Angular Head Grinder is adjustable. It has a standard Wheelhead Unit mounted so that it may be located to grind from 0 degrees to a 45-degree angle. The Bowgage head can be swivelled to various positions for standard plain cylindrical grinding, providing a wider range of grinding.

The Fitchburg Type "C" is completely automatic, the workhead is adjustable for various lengths of work and the work spindle can be equipped for single or variable work speeds.

The Fitchburg Type "C" Grinder is designed to meet wartime production speed and maintain highest efficiency. In every detail it meets all the requirements of plain cylindrical and taper grinding — in large or small lots of work, with assured accuracy and fine finish, at low cost. Write for complete information today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

PRECISION MACHINES GENERATE PRECISION THREADS — *Faster*

LEES-BRADNER

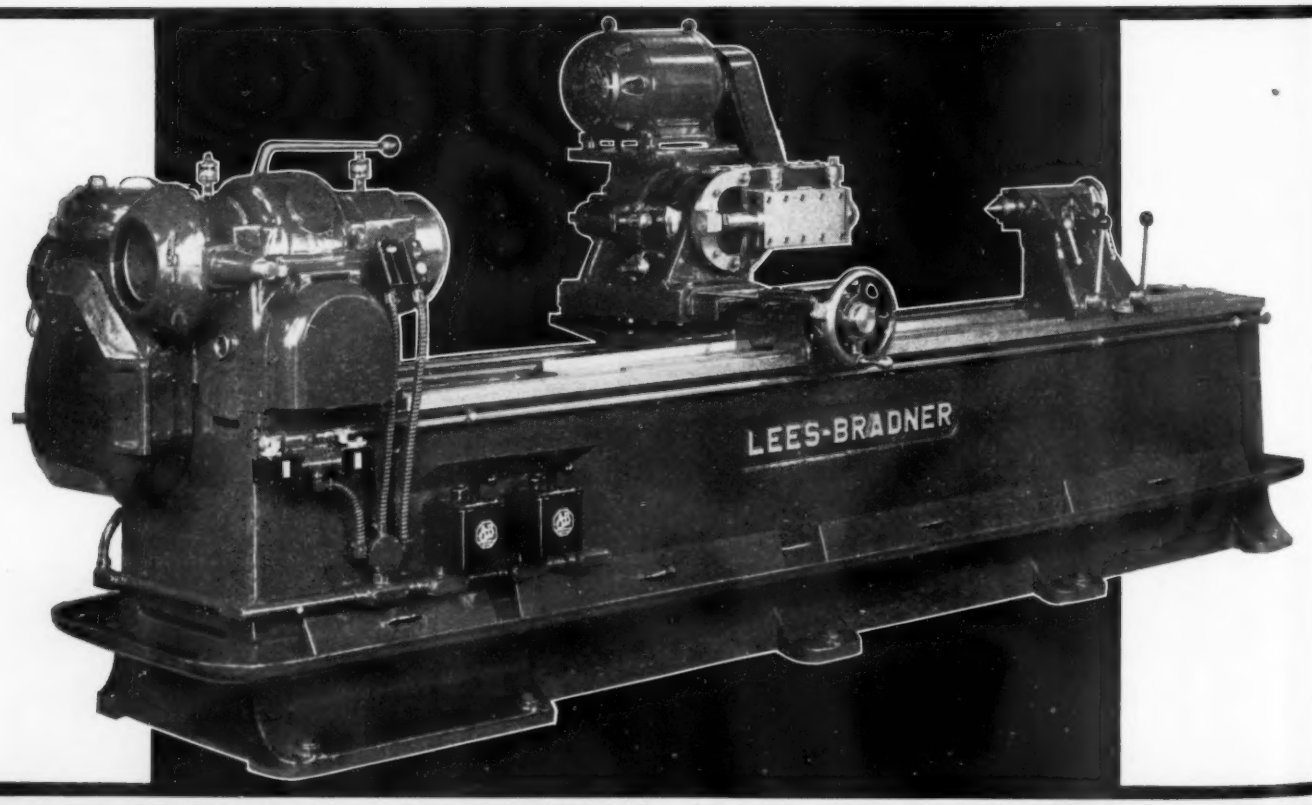
Heavy Type Thread Milling Machine

● The development of this L. B. Thread Miller marks one of the most important advances in precision threading.

Due to its inherent ruggedness, feeds and speeds far in excess of previous practice are possible. Better finished threads are turned out in a fraction of the time required by former methods.

For larger, heavier components requiring threading, for work up to 12" in diameter and up to 2½" circular pitch, can be produced faster and to closer tolerances on the Lees-Bradner Heavy Type Thread Milling Machine.

Why not consult a Lees-Bradner Engineer for specific information on your work?



The LEES-BRADNER Company

CLEVELAND, OHIO, U. S. A.

. . . a name to be remembered.

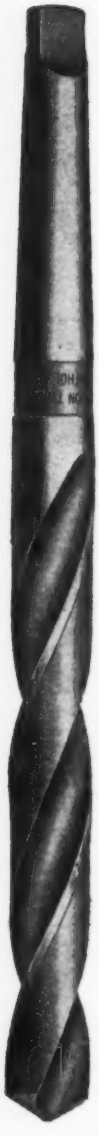
"THOMPSON" — just a name, but a name to be remembered. To our fighting forces it means "Tommy" Gun — they got them on time, when needed. And our production lines will remember "THOMPSON" — to them it means dependable tools — dependable to work with — dependable because of our ability to produce on time, hundreds, thousands—dependable because the name "THOMPSON" is behind them. On the firing line—on the production line—"THOMPSON" is dependable.

ARMY E NAVY

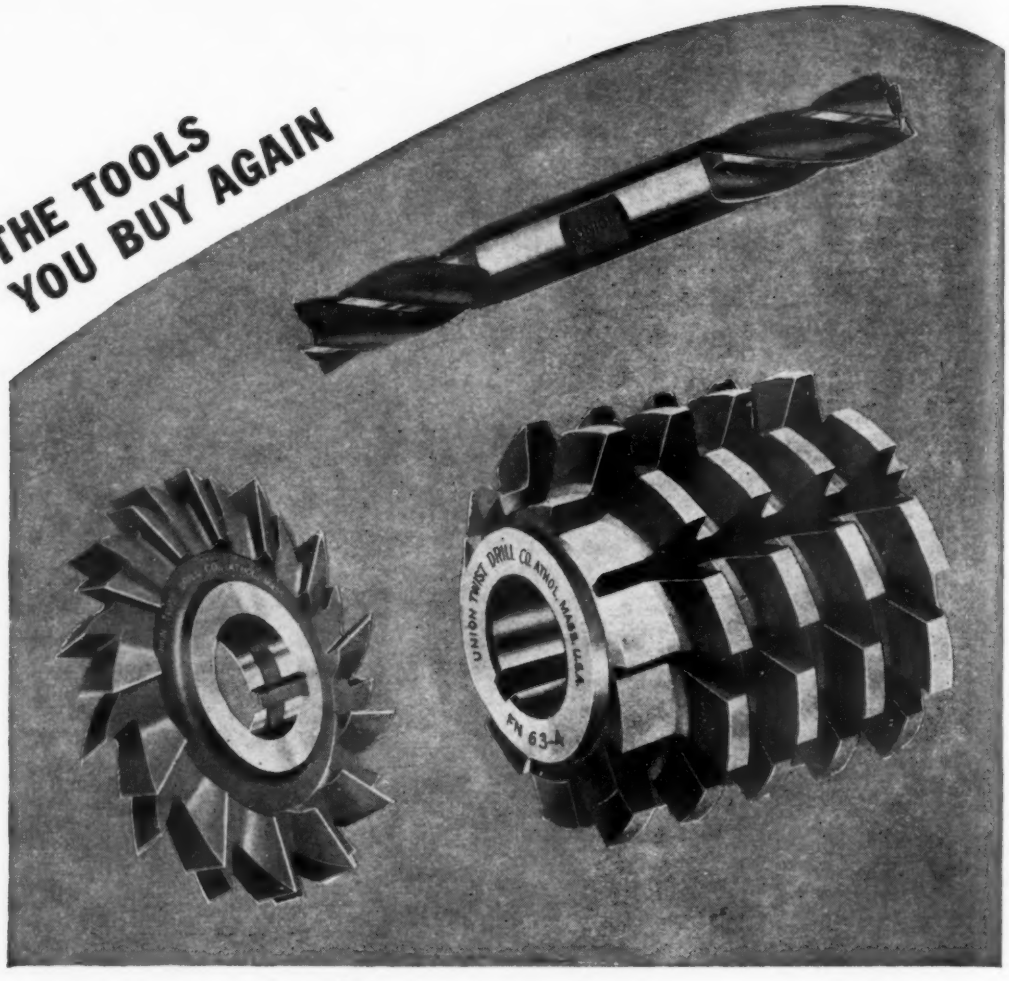
Awarded to Auto-Ordnance Corporation for excellence in production of "Tommy" Guns.

AUTO-ORDNANCE
CORPORATION
Thompson Tool Division

342 WEST PUTNAM AVENUE, GREENWICH, CONNECTICUT



Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies—Screw Plates— Profile Cutters.



SMALL TOOLS FOR BIG SAVINGS

Union's eminent position in the small tool field is the result of the meticulous care taken in the selection of materials, specialized and competent metallurgical experience, modern manufacturing facilities and rigid inspection. Small tools by Union make big savings in cutting time, assure accuracy and more cuts between grinds because every care is taken in every phase of production to realize faster cutting, higher cutting efficiency and more economical results.

You can buy UNION TOOLS on faith—and you'll continue to use them for performance.

UNION TWIST DRILL COMPANY

ATHOL, **MASS.**

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
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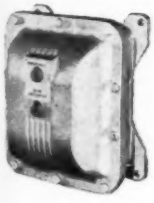
Representatives throughout the world

UNION

FOR THOSE DANGER SPOTS IN WAR WORK

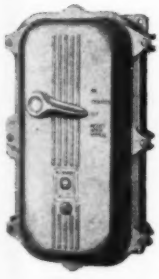
DANGER *Acetone*

"De-ion" Motor Watchman for manual motor starting.
(Class I and II hazardous locations.)



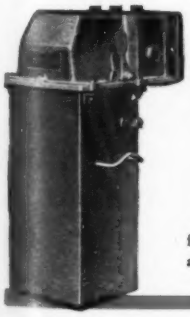
DANGER *Naphtha*

"De-ion" Linestarter for magnetic across-the-line motor starting.
(Class I and II hazardous locations.)



DANGER *Coal Dust*

"De-ion" Combination Linestarter for circuit protection and magnetic motor starting.
(Class II hazardous locations.)



DANGER *Gasoline*

Oil-immersed "De-ion" Linestarter for use in corrosive and explosive atmospheres.
(Class I hazardous locations.)

. . . use Westinghouse "De-ion" Controls for hazardous locations

Controls for motors must "make" and "break" circuits safely in spite of explosive atmospheres in ammunition plants, chemical, oil refining and other war industries. Production must be kept moving . . . and safely!

That calls for Westinghouse A-C Motor Control specifically designed for the job.

Cast-iron or welded steel enclosures with heavily reinforced sections and wide sealing flanges are designed in accordance with Underwriters' Laboratories specifications for Class I, Group D and Class II, Groups F and G hazardous locations.* For those applications where it is necessary to resist the effects of corrosive as well as explosive atmospheres, the Westinghouse line includes many combinations which are totally oil-immersed. These are designed in accordance with Underwriters' Laboratories specifications for Class I, Group D hazardous locations. Other design features keep maintenance at a minimum, provide complete accessibility when necessary.

Whether for replacement or for new installations in hazardous locations, specify Westinghouse Controls. Call your Westinghouse representative for his recommendations. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

★ ★ ★

J-21271

*Class I, Group D hazardous locations are those in which the atmosphere contains gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, or natural gas.

Class II, Group F and G locations include those in which grain dust, carbon black, coal, or coke dust is present in sufficient quantities to produce explosive mixtures.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

MOTORS AND CONTROL

Sets Up Quickly Runs Profitably on CLEVELAND AUTOMATICS with UNIVERSAL CAMMING

Standard universal cams furnished with Clevelands are quickly and comfortably accessible, saving time and energy of the set-up man. The proportion of production time against set-up time is a profitable one in Cleveland Automatic operation.

THE job shown in work on a Cleveland Automatic in the photograph at right may not be *exactly* like any job you have problems on at the moment, BUT . . . The savings made, in cost and in production time, on this piece are typical of savings anyone concerned with production wants to make, so give a moment's consideration to this case history . . .

Stock . . . 6½ inch bar, 4160 steel, hot finish.

Operations . . . Gauge, rough drill, rough turn O.D. in two stages, form O.D. complete, rough bore, finish bore, ream and cut off. Finish length 9 1/16 inches. Length of body (formed with one tool) 6½ inches.

This Job Was Set Up Quickly . . . because every operation on a Cleveland Automatic is controlled by standard cams, easily reached and quickly set to any position with the aid of an exclusively Cleveland universal adjustment feature. All control settings are simplified by quick-reading calibrations which reduce original set-up time to a remarkable minimum, also make it possible to retool accurately for a re-run by simply keeping a record of the set-up formula.

Ran Profitably . . . because one Cleveland accomplished what two machines and operators had formerly done, resulting in a saving of more than 62 per cent. This is typical of Cleveland Automatic economies.

That is why, with men responsible for production, Clevelands have a reputation for two important advantages . . . 1. Maximum sustained production on long runs, with minimum down time for adjustments . . . 2. Profitable economy on small-lot, short-run jobs.

Just Remember.."CLEVELANDS CUT COSTS"

THE CLEVELAND AUTOMATIC MACHINE COMPANY

CLEVELAND, OHIO

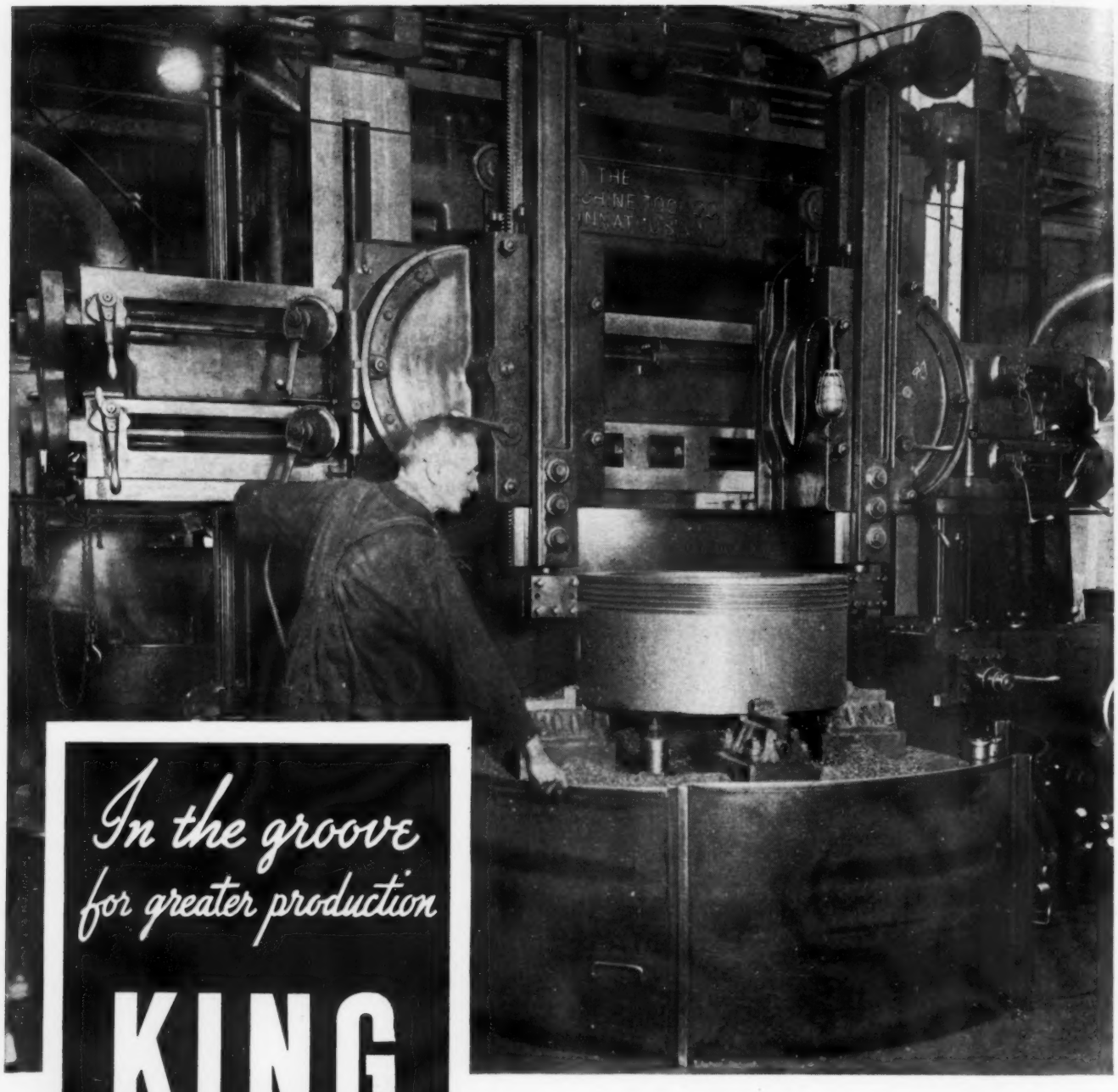
SALES OFFICES

CHICAGO: 20 North Wacker Drive, Civic Opera Bldg., Room 1408
DETROIT: 540 New Center Building
NEWARK: 902 American Insurance Bldg.
CINCINNATI: 1315 American Building

CLEVELAND *Single Spindle* AUTOMATICS

MODEL A—Built in 1 1/16-inch to 9 1/2-inch capacities inclusive

MODEL B—Built in 1 1/16-inch to 2 1/2-inch capacities inclusive



In the groove for greater production

KING

VERTICAL BORING *and* TURNING MACHINE

● Here a King Vertical Boring and Turning Machine has completed the turning operation on a semi-steel flywheel and drive unit and is now grooving the piece. ¾ inch deep grooves are being cut at approximately 35 feet per minute on this 36" dia. wheel. One head cuts a narrow groove which is cut to desired width and depth by a forming tool which is fed in on the other head. Both heads work simultaneously over most of the grooving operation.

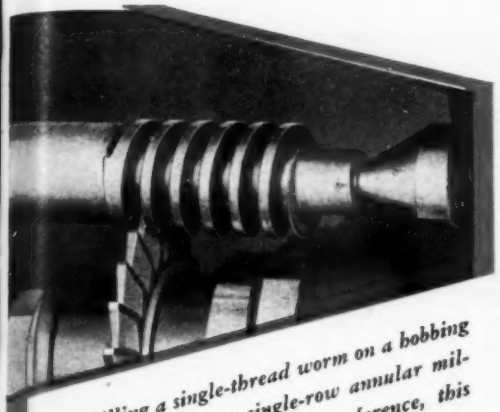
For your boring, turning and similar operations King Vertical Boring and Turning Machines will save time—maintain tolerances—reduce costs.

The KING MACHINE TOOL Company

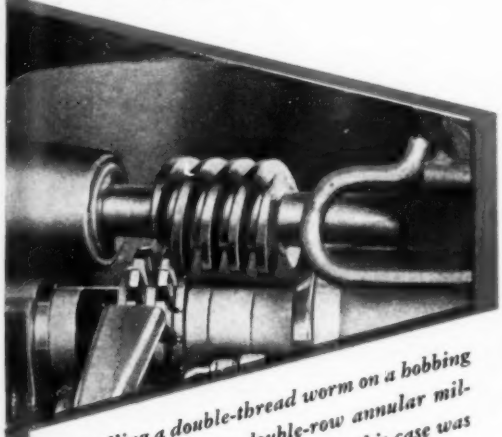
BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

CINCINNATI, OHIO

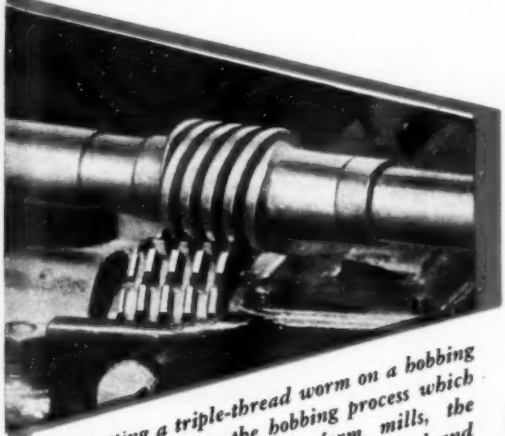
Barber-Colman
HOBBING MACHINES
can be used for
THREAD MILLING



Milling a single-thread worm on a hobbing machine, using a single-row annular milling cutter. To avoid interference, this cutter is mounted on a stub arbor.



Milling a double-thread worm on a hobbing machine, using a double-row annular milling cutter. The hob swivel in this case was modified to provide needed clearance.



Cutting a triple-thread worm on a hobbing machine, using the hobbing process which generates, rather than form mills, the threads. A 90-degree spindle is used and the hob has tapered teeth on one end.

THE process of milling worm threads requires a slow-turning work spindle and a cutter spindle which can be set at an angle to correspond with the helix of the thread. The cutter is fed at a rate of exactly one pitch per revolution of the work. Barber-Colman Hobbing Machines can be easily set up to accomplish these actions. Carriage feed and work rotation are synchronized through a gear train having a wide range of adjustments. Cutter speed is determined by a separate set of change gears. In this way, the advantages of accuracy and production inherent to the hobbing process can be used for thread milling. In some instances, owners of hobbing machines may thus use them for producing worms and other threaded pieces instead of using a special machine.

A FEW LIMITATIONS . . .

When a hobbing machine is set up for thread milling, the cutter spindle is necessarily swivelled so that it is nearly parallel to the work spindle. The work may be such that this will introduce interference between the bearings or gear case of the hob spindle and other parts of the machine. These can usually be avoided by special work-holding means, or by using a 90 degree attachment on the hob spindle. The milling process is used on single and double thread worms; most pieces with three or more threads are hobbed. Our engineers will be glad to work with you on your worm milling problems.

See "HOBBING NOTES"

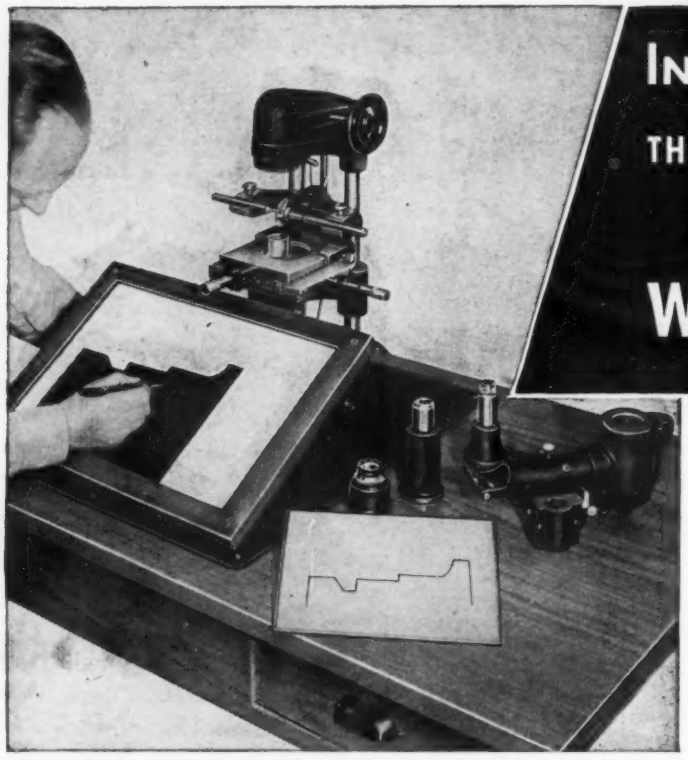
The subject of worm thread milling on a hobbing machine was comprehensively covered in an article which appeared in Barber-Colman *Hobbing Notes* for March, 1939. We suggest you look up this discussion for further details.

Buy War Bonds

BARBER B-C COLMAN PRODUCTS
HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.



INSPECT and CHECK . . . THE SIMPLE, ACCURATE, FAST WAY *with the* WILDER PROJECTOR

This optical device—providing the means of measuring and comparing objects by means of a magnified image—offers many opportunities for speeding inspection, assuring accuracy and eliminating guess work. For example, it can be effectively used for

. . . checking threads. Inaccuracies invisible to the naked eye or not detected by thread plug and ring gages are magnified and made quickly visible on the Wilder Projector.

. . . checking tools and gages in a manner which catches inaccuracies at their source.

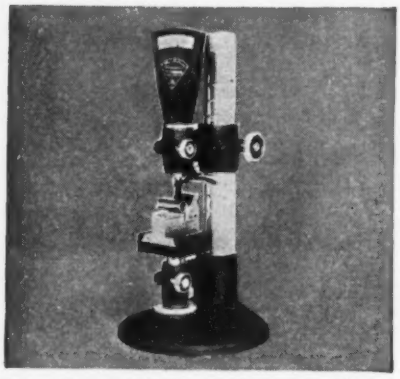
. . . verifying tool settings through ability to check the first parts produced.

. . . checking up and controlling tool wear by periodically inspecting samples of work being produced.

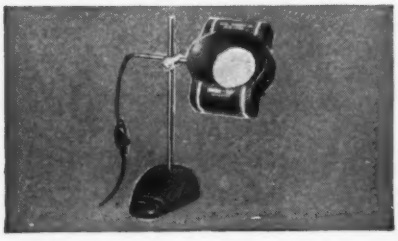
. . . inspecting of finished product to determine its conformance to specifications.

The Wilder Projector is extremely versatile in the scope of work it will handle yet it provides this wide range of utility at low initial cost. It will pay for itself many times over in the savings it will make through eliminating spoiled work. It is sturdy in construction and easy to operate. Investigate today!

OTHER INSTRUMENTS IN THE SCHERR LIMITED BUDGET INSPECTION LABORATORY



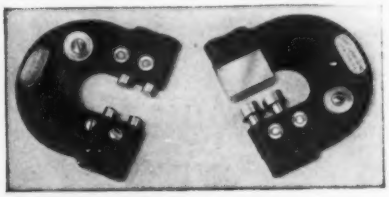
Scherr Comparitol—for checking gage blocks, gages and work for size, accuracy and wear.



Magni-Ray—a wide field illuminated magnifier for close inspection of work and operations.

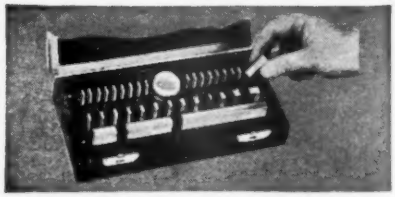
SPECIFICATIONS . . .

Standard Magnifications—10x to 100x
Space occupied in bench—21"x24"
Height over bench—18½"
Depth below bench—20"
Size of screen—10½x16"
Size of cross slide stage—6"x5"
Capacity between centers—5"
Maximum swing of centers—2½"



Atlantic Adjustable Limit Snap Gages—for accurate check-up, without having to depend on operator's skill. Sizes to 6".

Spencer Binoculars—for detecting surface finish, imperfections, etc., by means of 3-dimensional vision.



Ultra-Chex—a 3" block set accurate to .000008" and providing a basic standard of measurements.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.

THEM!

You are looking at the Board of Directors of one of the busiest companies in the world. It is the firm of Gremlin, Widget & Finella, Inc.,* specialists in the new light-metal headaches — magnesium migraines, aluminum ailments and general alloy trouble.

As the Light Metal Age swings into mass production, this company finds itself with advance orders on hand for some of the biggest headaches in history, and already its record in the highly technical field of industrial interference is an impressive one.

One of the most notable achievements of G. W. & F. has been their handling of the weight factor in horsepower development. For years they have kept the ratio of pounds to horsepower high in all types of engines, and only the sheerest engineering genius has succeeded in producing one horsepower with slightly less than a pound of metal — yet 5 or even 10 horsepower may be possible with a pound of the right alloy.

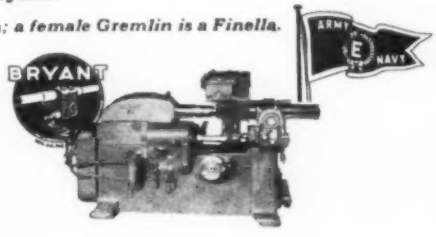
Likewise, this new subsidiary of the Headache Trust has done some pretty whimsical and spectacular things with metal, causing magnesium dust to explode, and the metal to dissolve back into sea water like so much salt. Bearings have been known to crystallize within a few hours from vibration alone, and the ideal bearing surface is one so hard that the cost of working it is still a major headache.

As specialists in internal grinding, we at Bryant have helped to cure many a new and serious headache in the working of light metals, super-hard alloys, and other new materials. We have helped to develop safer processes for machining light metals, improved methods of grinding and finishing the super-hard tungsten-content alloys, and new techniques for working such materials as hard rubber, glass, graphite, plastics, bronze and cast iron, as well as centrifugally cast steels and alloys from hundreds of new specifications.

If your business calls for the use of precision machine tools, Bryant's Consulting Service can be of greater value to you today than ever before. We urge you to "Send for the man from Bryant!"

Subsidiary of the Gremlin Headache Trust. A Widget is a young Gremlin; a female Gremlin is a Finella.

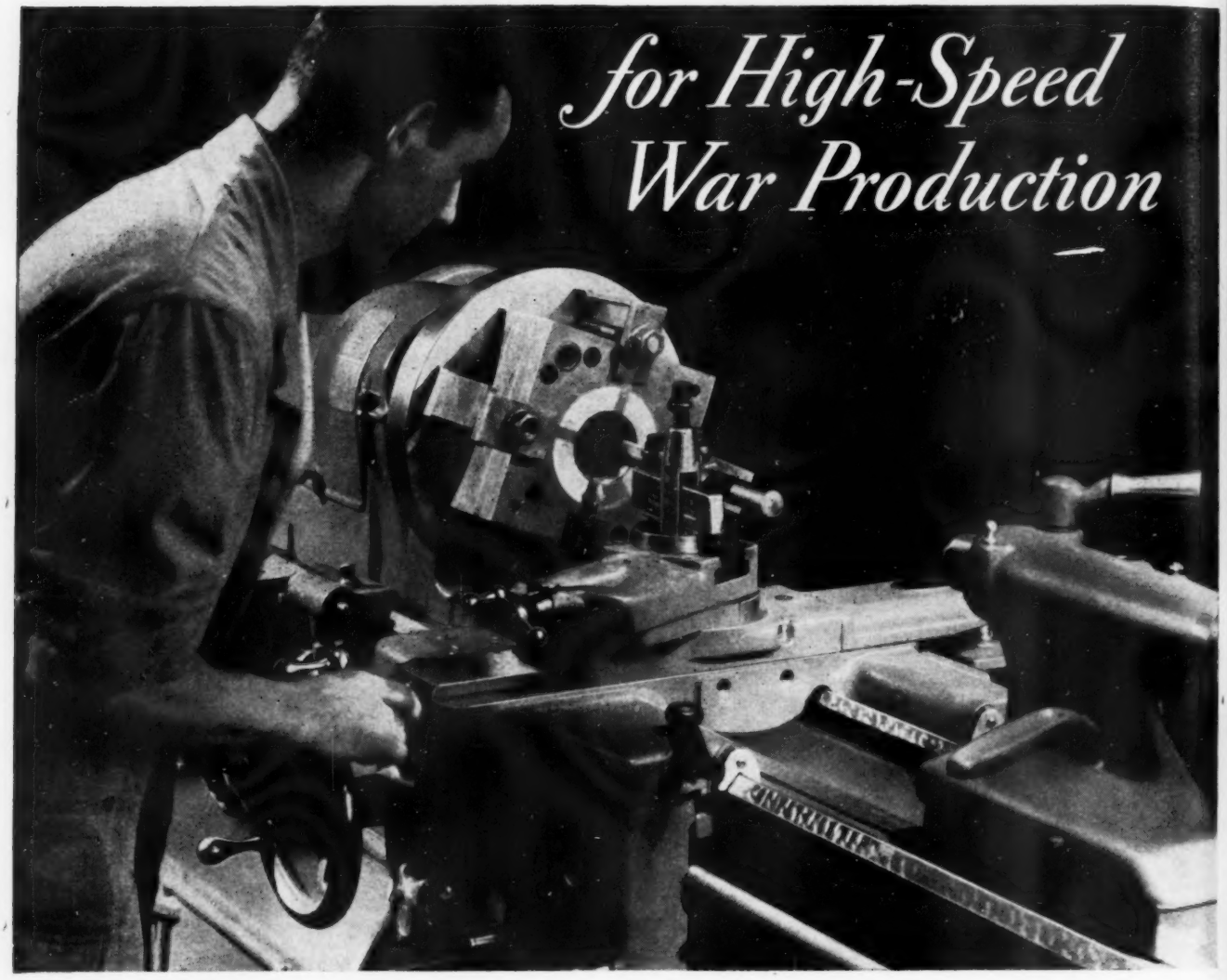
SEND FOR THE MAN FROM BRYANT.



Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.

HIGH PRECISION



High precision is the key to high speed war production—for mass production is based on a degree of accuracy that assures the perfect interchangeability of parts and units.

In hundreds of war production plants, South Bend Lathes are preferred because their high precision makes it easier to maintain exacting tolerances on important toolroom and production operations.

Modern in design, built to the highest standards of workmanship, South Bend Lathes are capable of performing finish turning and boring operations with such accuracy that subsequent grinding, honing, or lapping operations can often be eliminated. A wide range of spindle speeds permits taking full advantage of carbide or diamond tipped tools.

Convenient controls make for an ease of operation which reduces fatigue and lessens the possibility of error. Requiring a minimum of effort to run, South Bend Lathes are especially desirable where women lathe operators are employed. Write for your copy of Catalog 100C which describes South Bend Engine Lathes, Toolroom Lathes and Turret Lathes.

Buy War Bonds!

ARMY E NAVY

"HOW TO RUN A LATHE"

A practical operator's handbook for apprentice training that covers the fundamentals of lathe operation. It contains 128 pages, 5⅛″ x 8″, and over 365 illustrations. Price 25c per copy. Sample copies free to shop superintendents and apprentice supervisors.

SOUTH BEND LATHE WORKS

SOUTH BEND, INDIANA • LATHE BUILDERS FOR 36 YEARS

CARBIDE TIPPED TOOLS

FOR MACHINING OF
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BRASS
BRONZE
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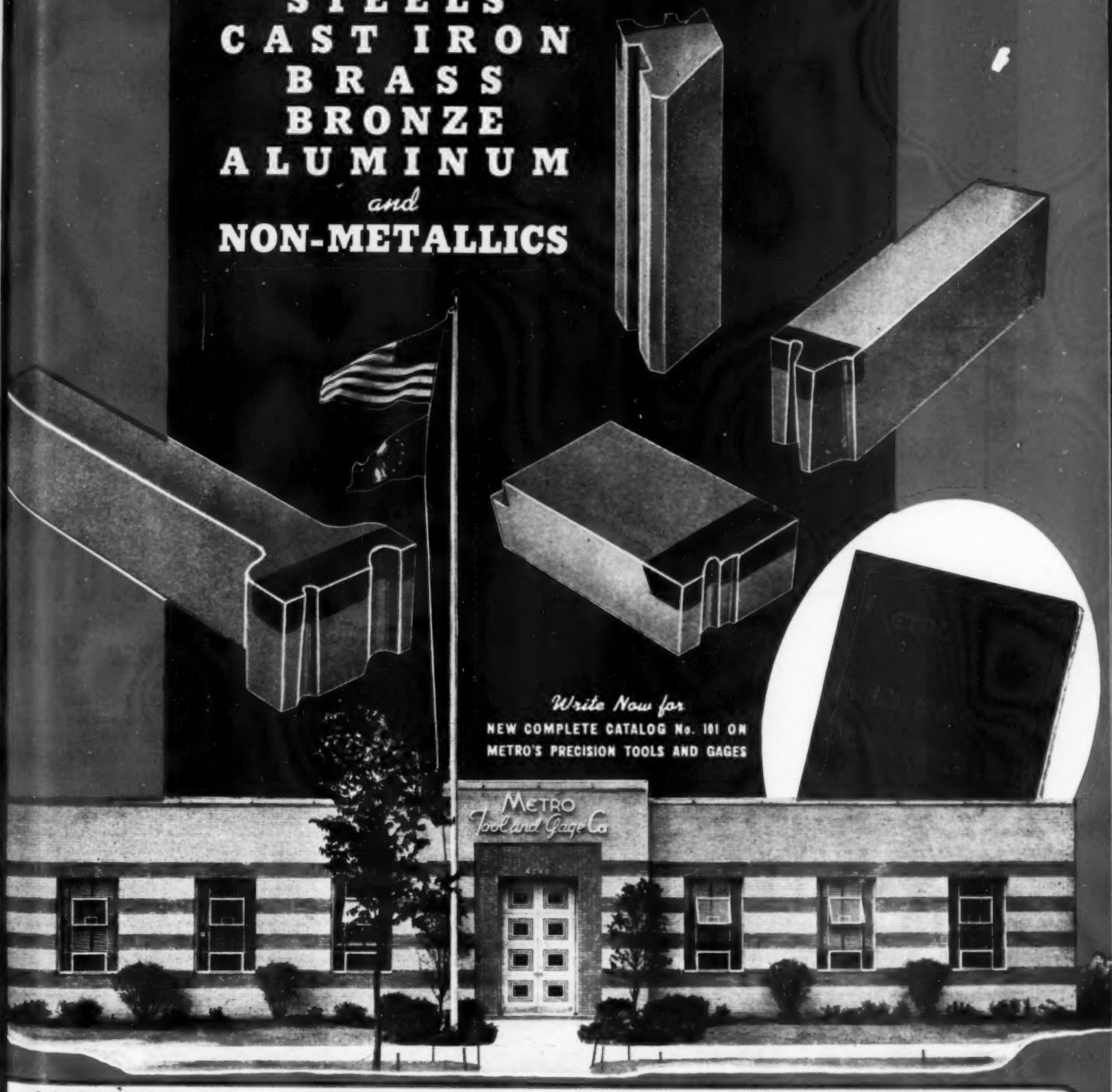
and
NON-METALLICS



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METRO'S PRECISION TOOLS AND GAGES

A MODERN PLANT . . . MODERN METHODS . . . FOR PRECISION TOOLS AND GAGES

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TOOL AND GAGE CO.

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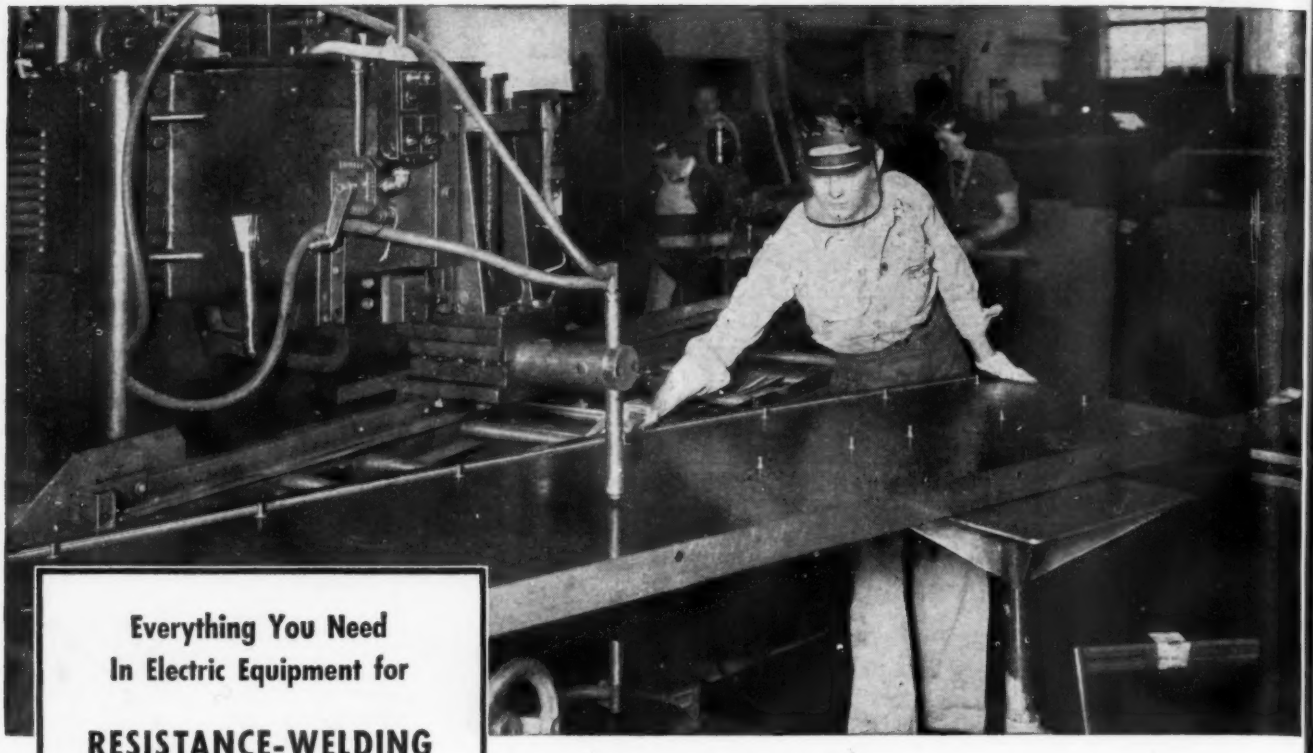
CHICAGO, ILL.



Everything You Need In Electric Equipment for

RESISTANCE-WELDING MACHINES

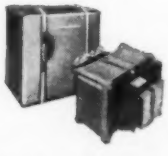
Electronic controls for spot and seam welders

Electronic weld and sequence timers

Weld-recorders—to record electrical input of EVERY weld

Electron tubes for all purposes

Cables and instruments



Air circuit breakers and welding transformers

Capacitors for power-factor improvement

Motors and control

How Spot-welding

SAVED 6 OPERATIONS

in Mounting These Studs

Today—

Insert a stud in the electrode and press the foot-switch. Before your foot returns to the floor, the weld is completed—strong, tough, *fast*. Stud and panel become *one piece* in *one operation*. Yesterday, before spot-welding took over, each stud took *seven operations*.

The Old Way—

Drill a hole, tap it, countersink it, screw in the stud, peen it (so it won't turn), grind off the rough surface, fill the stud head. *Seven* long steps. With 7 tools. But you can *spot-weld* a stud to that panel in the wink of an eye.

Resistance welding with precise electronic control is speeding the construction of light-metal and stainless-steel aircraft. Replaces soldering operations, too, saving tin and time. Joins like or unlike metals or alloys. Gives dependable, consistent results.

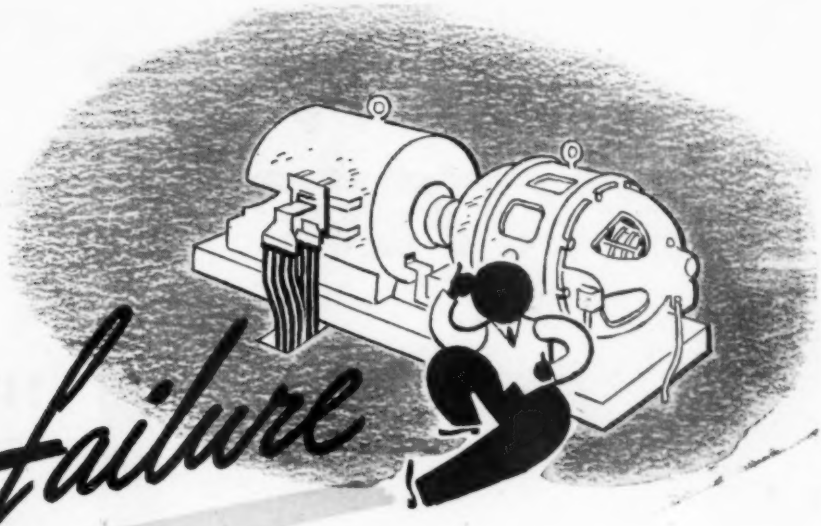
It makes gas-tight seams. Saves materials. Simplifies design problems. Relieves the shortage of skilled operators. Resistance welding is ideal for high-production operations on heavy or light work, portable or fixed, with men or women operators.

Whatever your application, be sure to specify G-E *electronic* control and electric accessories with your resistance-welding machine. For further information, contact any G-E office, your resistance-welding machine manufacturer or agent, or write Electronic Control Section, General Electric, Schenectady, N. Y.

Speed Production Electronically

GENERAL ELECTRIC

645-22-8960



Friday's failure

MAKES GUN MOUNTS ON TUESDAY

FRIDAY THE THIRTEENTH, 9:00 A.M., ARMATURE FAILED IN 1500 AMP. MULTIPLE-OPERATOR WELDER. LOST PRODUCTION FOR 15 MEN. WELDER DELIVERED TO WESTINGHOUSE DISTRICT MANUFACTURING AND REPAIR PLANT. NEW COILS FORMED, INSULATED AND TREATED. ARMATURE REWOUND. NEW EQUALIZER MADE AND INSTALLED. TURNED AND POLISHED COMMUTATOR. TUESDAY, THE SEVENTEENTH, 8:00 A.M., BACK ON THE JOB TO MAKE GUN MOUNTS FOR SMACKING THE AXIS.

Westinghouse

DISTRICT MANUFACTURING AND REPAIR

J 90463

***IF* THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR**

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

FOR BETTER CUTTING

Switch to

THESE FIRTHITE GRADES FOR BETTER CUTTING AND TO SAVE SCARCE TANTALUM

FOR STEEL CUTTING—These FIRTHITE Tungsten-Titanium Carbide grades stay sharp longer, cut faster, and make smoothest finish. They are described in FIRTHITE Price List FE-105 . . . or, a FIRTHITE Engineer will gladly discuss them in your plant.

FIRTHITE

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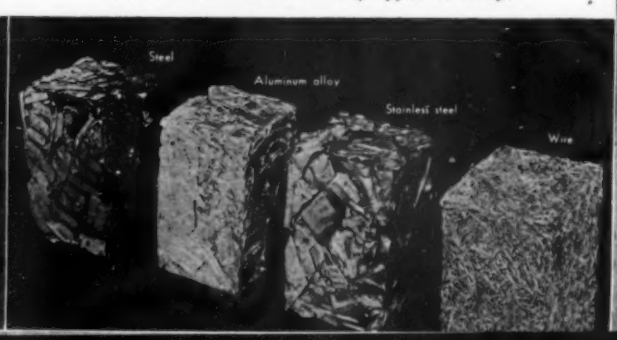

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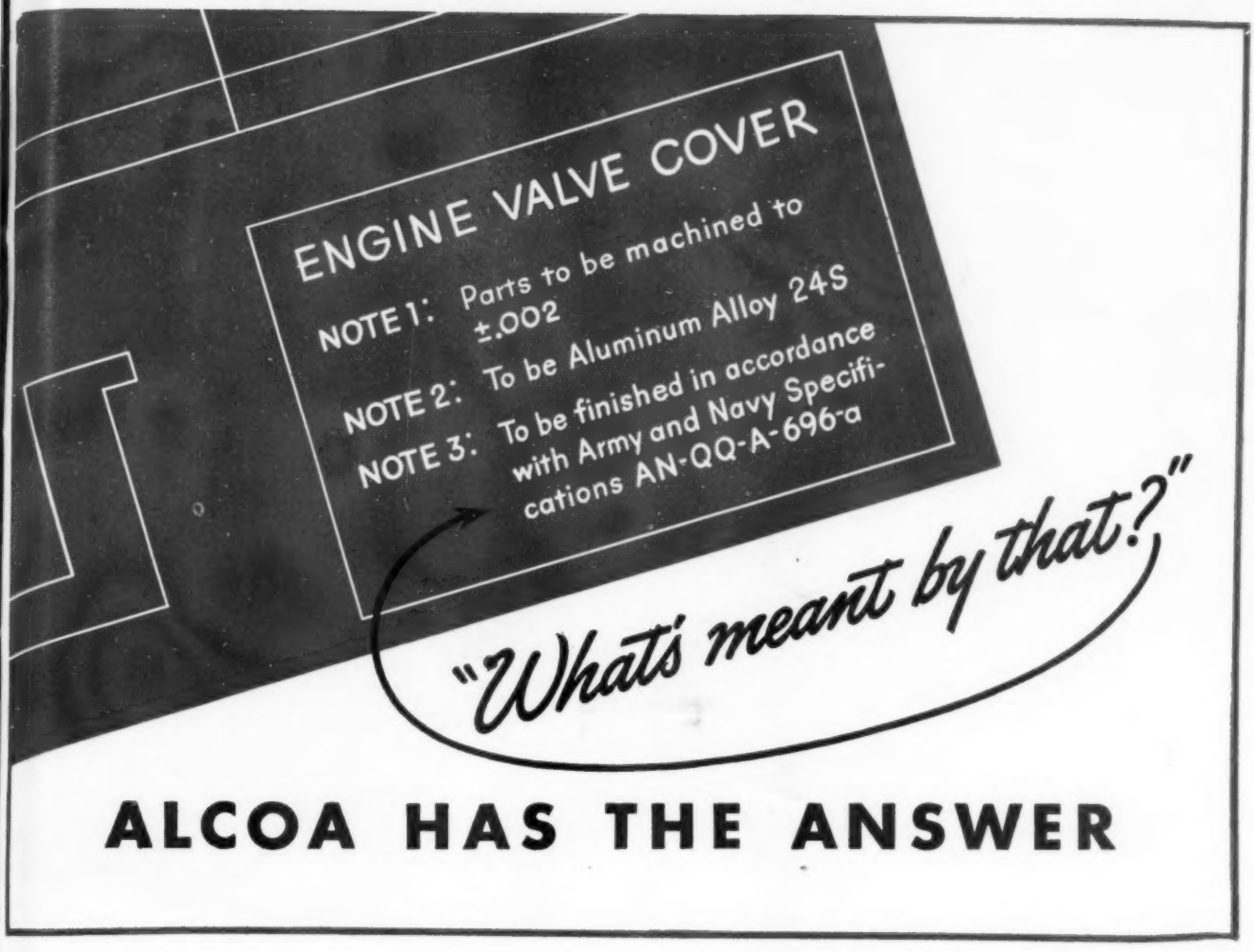
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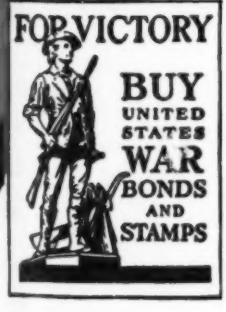

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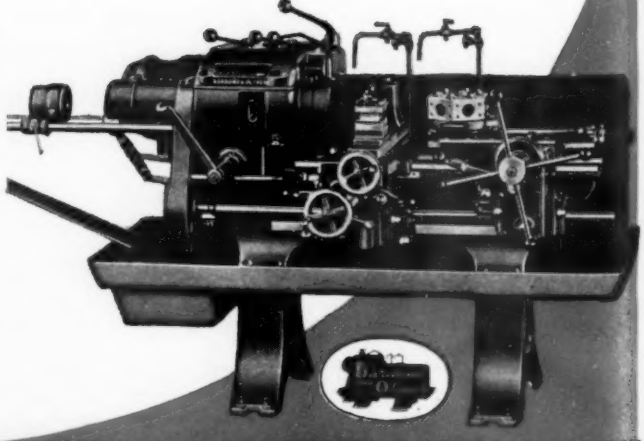

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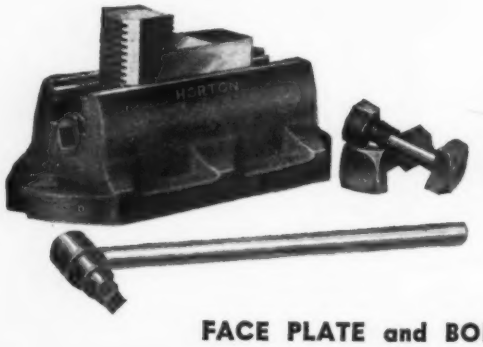

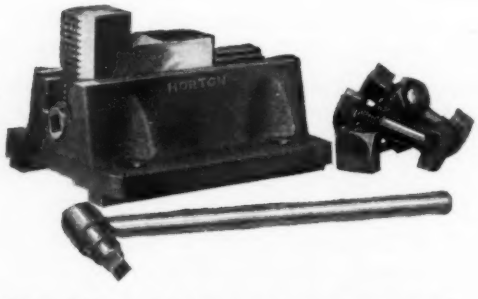

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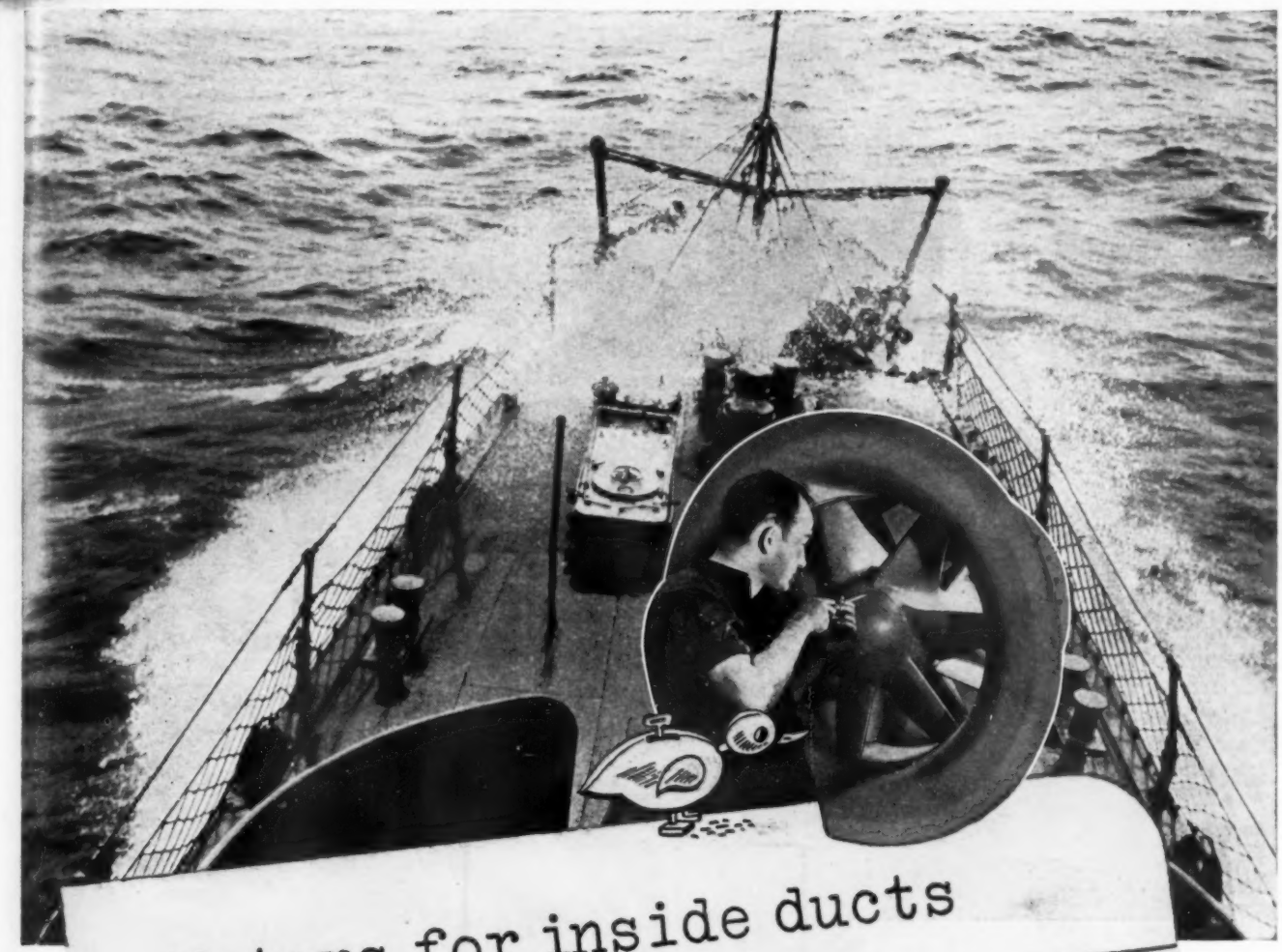

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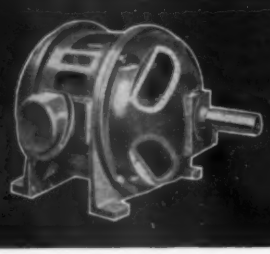

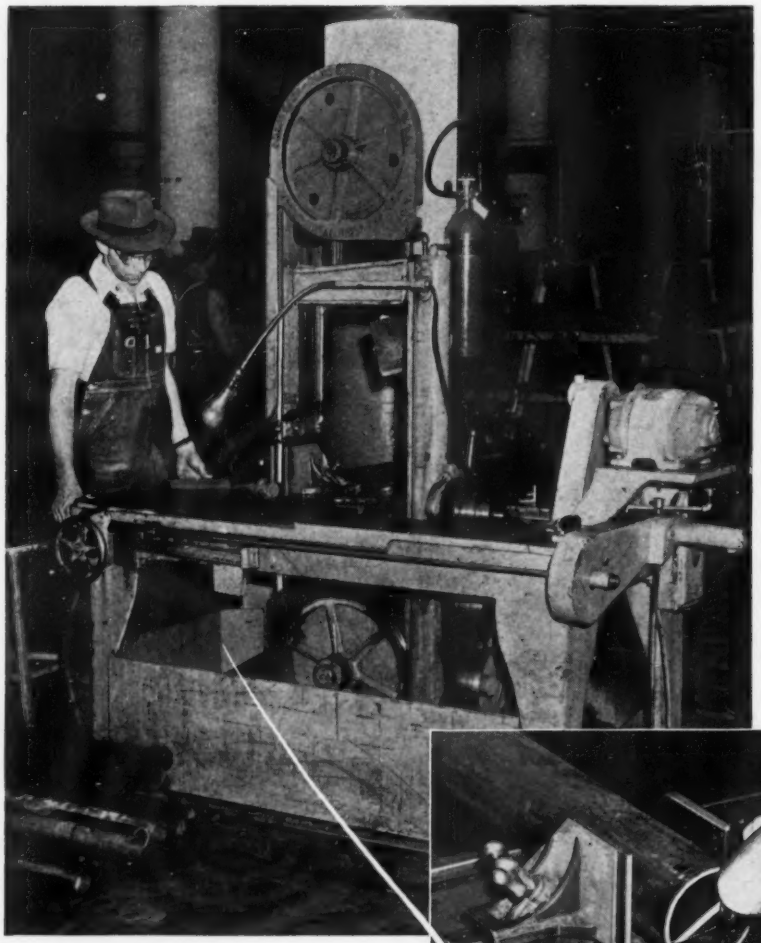

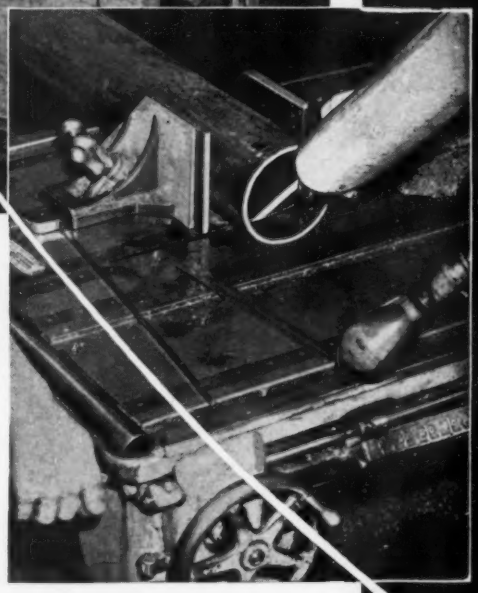

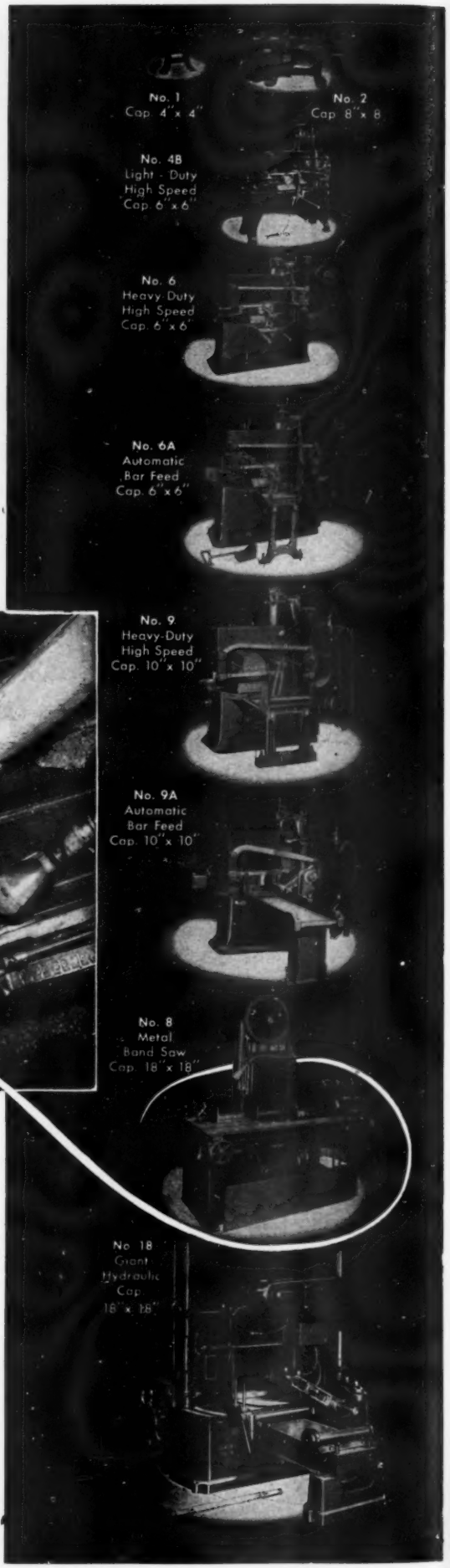

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Photos (top) U. S. Army Air Corps; (others) U. S. Army Signal Corps

We've got to raise our sights this year, to turn out the planes and the tanks, the trucks and the guns we need. And here's the machine that on a thousand production lines is turning estimates into performance . . . the Bullard V.T.L.

For over 40 years the special function of the Bullard Vertical Turret Lathe has been to save time. It has two independent cutting heads. Constant operation saves the time between cuts. Rigidity is engineered into every part—to guarantee sustained accuracy. We're working day and night to produce more and more V.T.L.s . . . for every one we can put in your shop means greater assurance of vital production for victory.

BULLARD

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

SWENSON went a thousand miles . . . to work for half an hour

A Short Story complete on this page

AXEL SWENSON* is a gnarled, sawed-off little Swede. He's been with Pratt & Whitney since he was a boy, and that was in the '80s.

P&W sent a jig borer out to the Red River engine plant awhile back; something had happened to it in transit, and the Martin men couldn't put it together right. They called P&W. It was a job for Axel Swenson.

A P&W jig borer, you know, is one of the things that make mass production possible. It's the world's most accurate machine tool. Its base holds the work in position; its upright column holds the tool. Theoretically, that column ought to be at right angles to the base . . . no more, no less. But of course, that's just theory.

Well, this jig borer at Martin was out of line by some three ten-thousandths of an inch per foot . . . much too big an error to suit either Pratt & Whitney or Martin. Axel was pushed into a plane and away he went, his tool bag under his arm.

Little Axel Swenson walked up to Martin's plush-lined offices and stated his business. They led him out to the machine and he went to work.

For fifteen minutes he just measured the job with instruments from his kit. Then "Hoist 'er oop," he told the man on the crane. The rope slings stretched; the column went up off the base. Axel reached over and scraped the base joint tenderly, slowly, in the place his "know how" told him to touch.

Five minutes later he stepped back. "Hokay," he told the crane man.

Martin men did the measuring this time. They turned to Axel with a gasp. "Only one ten-thousandth of an inch out!" Excited comment rose from the group like a cheer.

Axel was tucking his glasses back in his pocket and putting his tools away when a Martin man, a mischievous twinkle in his eye, stepped up. "Hey, Axel, aren't you going to take out that other tenth?"

Axel looked up slowly. That was asking a lot. That was like asking a man who had just walked across Niagara by tightrope to try it again on one foot. Axel didn't speak. He put his glasses on and got out his measuring tools.

Now the word spread through the Martin shop like wildfire. Axel Swenson is going to try to take out a tenth! In hushed silence, men gathered to watch the old Swede who was locking horns with the infinite.

He had his measurements now. "Oop," he told the crane man. Then he reached in and scraped the selected spot . . caressingly, gently as a mother her babe. He stepped back. "Hokay," he said. He picked up his tools and headed for the door.

He picked up his tools and headed for the door.

"Hey! Wait a minute!" the Martin man called after him. "You can't leave here yet!" They hadn't even had a chance to check it. Maybe the old Swede had put it back to three tenths out, or even worse.

Axel yielded . . . paused at the door.

A Martin man straightened up, faced the group, his eyes bulging. "On the nose!" he breathed. "On the nose! Not a flicker out!" They looked around for Axel . . but Axel was on his way to the airport. It didn't surprise *him*.

* * *

Craftsmen like Axel Swenson and tools like the P&W Jig Borer are responsible in important measure for the success of American war production. Their precision underlies every large-scale metalworking operation. If you need *basic accuracy for mass production* — now in war work, later in peace — call on Pratt & Whitney, *Division* Niles-Bement-Pond Co., West Hartford, Conn.

**All names except our own are fictitious; the story, however, is fact.*

PRATT & WHITNEY

MACHINE TOOLS ★ SMALL TOOLS ★ GAGES

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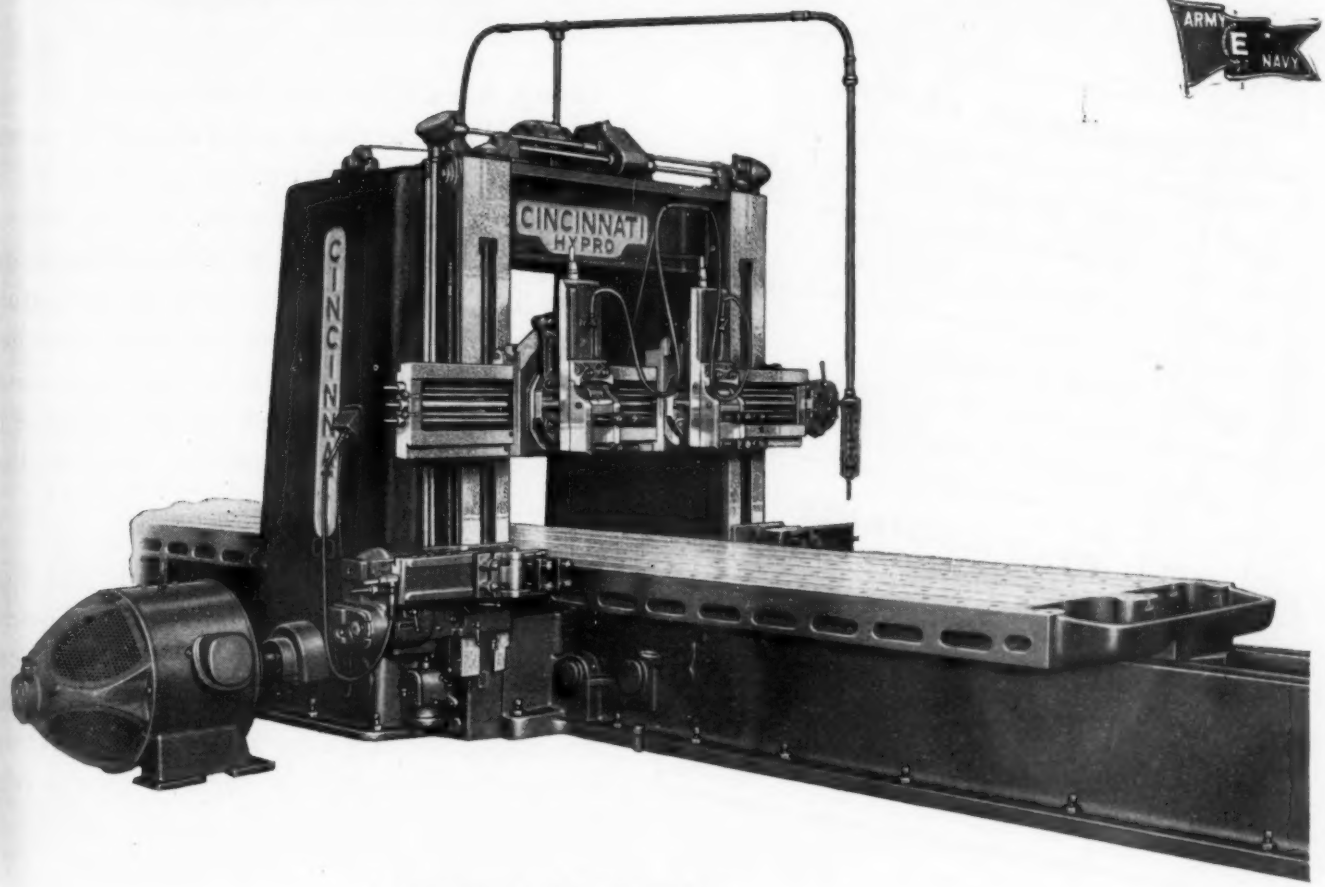
Basic Accuracy for Mass Production

CINCINNATI Hypro



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Knowing how to Correct Tool Troubles like these—

- ✓ HARDENING CRACKS
- ✓ SOFT SPOTS
- ✓ GRINDING CHECKS
- ✓ SIZE CHANGE
- ✓ SHAPE CHANGE
- ✓ Lack of WEAR RESISTANCE
- ✓ Lack of TOUGHNESS
- ✓ HEAT CHECKS
- ✓ SPALLING in SERVICE

Today, more than ever before, sound knowledge of "trouble shooting" is one of the essential requirements for getting the most out of your tool making facilities. Under all-out production, every care *must* be taken to get tools that will not fail prematurely and cause interruptions in schedules, or waste of skilled tool making time. Anything you can do to avoid troubles of this kind will be reflected in increased output—a definite contribution toward a speedier Victory.

How to spot tools that *look* all right but may actually fail prematurely, how to avoid grinding checks, how to guard against soft spots, how to get greater wear resistance—these are only a few of the questions to which it pays the tool "trouble shooter" to have the answers.

This will give you many Timely Tips . . .

You may find the answer to many of your tool room headaches in the chapter on "trouble shooting" (Chapter 18) of "Tool Steel Simplified." Here are many *practical* tips on common causes of premature tool failure. Actual examples of tools that let go in hardening and tools that failed too soon in service are shown. You are told *why* they failed and *how* the trouble could have been avoided.

This helpful information on "trouble shooting" is only part of the down-to-earth working data which "Tool Steel Simplified" is bringing to thousands of tool room men. Based on many years of active shop experience, "Tool Steel Simplified" covers the whole tool making picture—tool steel selection, tool making, heat treating, quenching, furnace atmosphere, testing—and it does it in easy-to-read, everyday language that any man in your shop will appreciate.

As an example of how practical "Tool Steel Simplified" is—how useful it can be right in your own shop or tool room—see the information on "trouble shooting" given on the opposite page.

More than 35,500 copies of "Tool Steel Simplified" are now being used in plants like yours to train new men—"upgrade" older hands — save time —"trouble shoot"— get better and faster production.

..helps to Avoid Delays in Production

"TROUBLE SHOOTING" Common Causes of Premature Tool Failure

Hardening Cracks—If a tool cracks in hardening, and there is nothing suspicious about the steel or the design, look at the nature of the crack. If the crack penetrates deeply—and does not parallel the length of the original bar—or if the crack shatters the piece, it may be due to one of two causes—too high a hardening heat, or placing a hard tool in a hot furnace.

In connection with this last cause, sometimes a tool does not come from the hardening just as the hardener wants it. He decides to reharden the job and throws it back into a hot furnace. This is a terrible strain on the hard tool and is likely to cause a shattered type of cracking. Since these tools cracked while still in the hardening furnace, the faces of the fracture will contain furnace scale. This definitely indicates that the tool either cracked on the first hardening—or cracked when placed in the furnace for the second hardening. Figure 1 shows the pieces of a tool that cracked in the furnace when an attempt was made to reharden it.

FIG. 1

Soft Spots—After a tool has failed, the trouble can sometimes be traced to accidental soft spots that occurred in the *wrong place*. This is the time to investigate them and take steps to either eliminate them —or to chase them back where they will do no harm.

A prolific cause for "thumb nail" checks in chipping chisels (Fig. 2) is a soft spot occurring on the bit a short distance back from the cutting edge. The crack encloses the soft spot. The cure for this trouble is to switch to a brine quench, whereupon the soft spot will disappear—and with it, the thumb nail check.

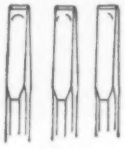

FIG. 2

Spalling—Hardening cracks that might be described as "spalling" or shelling off of corners and edges, are generally due to too low a hardening heat or to non-uniform hardening heat

The first cause can usually be distinguished from the second by the fact that there are likely to be soft areas on the underheated portions of the tool. A tool that has been non-uniformly heated may come out hard all over or it may contain soft spots. Fig. 3 illustrates a carbon steel reamer that was hardened from a lead pot and the extreme end spalled off in quenching. This tool was not in the lead long enough for the entire tool to become uniformly heated and only the end actually got through the critical far enough to properly harden. In order to demonstrate the lack of hardness on the body of the reamer, it was sawed part way with a hack saw and then broken the rest of the way. The *spalled end*, the *"bald-headed fracture,"* and the *soft body*—all point to non-uniform underheating.

FIG. 3

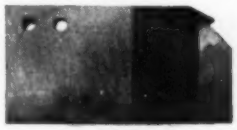

FIG. 4

Figure 4 is another example of "spalled" fracture from non-uniform heating. This is an oil-hardening tool steel. One corner has spalled off and the other has cracked. While the holes appear to have played a part in the failure, they are not the prime cause. This tool was soft on the flat faces which had not been hot enough, and was file hard on the spalled corners—a clear case of non-uniform underheating.

"Tool Steel Simplified"
315 Pages — 205 Illustrations. Available *at cost* in the U. S. A., $1.00 a copy ($3.50 elsewhere).

The information on "trouble shooting" given above is just a part of the helpful data covered in one chapter of "Tool Steel Simplified". You can put all the useful information the book contains to work for you, right in your own shop and tool room, by providing copies for the men you want to train—for those who want "refreshing". Order as many copies as you need, today.

The Carpenter Steel Company, 105 Bern St., Reading, Pa.

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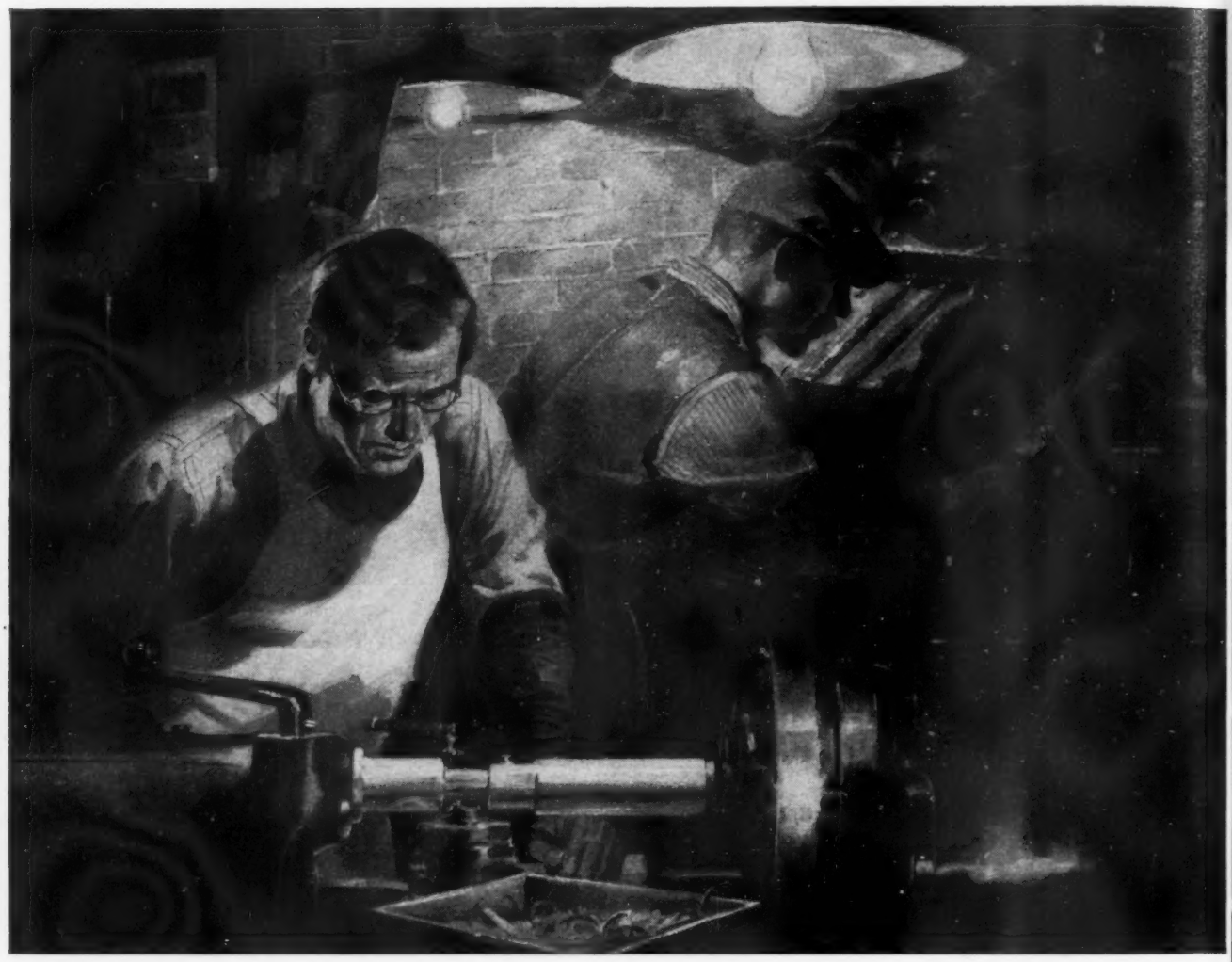
Can you find the Three Saboteurs?



YOU'LL have to look sharp to spot the three "saboteurs" in this picture. They're not enemy aliens, though they might just as well be, because they're actually sabotaging night shift production in war plants all over the country.

See the glare (A and B in the diagram below) from those half-shaded bulbs? And see the reflected glare (C) from the machinery? Glare is Saboteur No. 1. It makes men squint and strain, tires them out before the shift is half over.

And look at the man on the right. To avoid the glare he's working in his own shadow (D). Shadows are Saboteur No. 2—as any machine shop worker can tell you.

The third Saboteur (E and F) is Dirt on walls, ceilings and light fixtures. For want of a regular cleaning program, dirt can quickly cut light output in half—even on a new lighting installation.

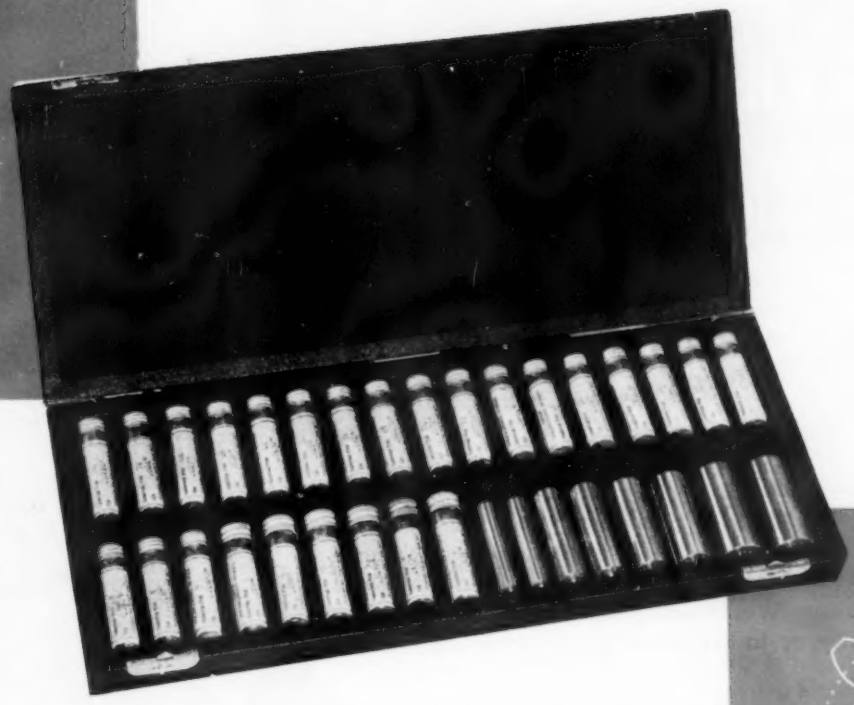
An Invitation to Production Men

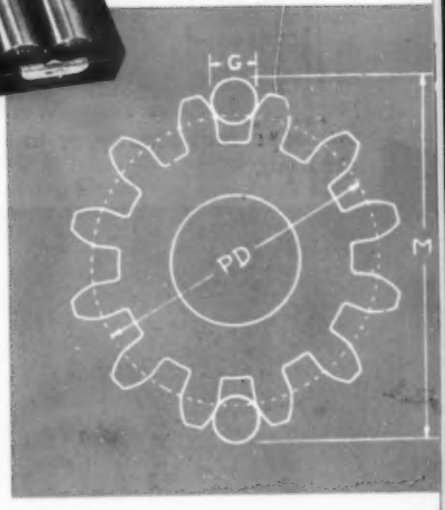
Lighting may be the least of your problems. But it may be the answer to some of your *other* problems. We'd like to take the lighting problem off your shoulders, by sending a G-E Wartime Lighting Counselor to check your lighting and show you how it can be improved with the least possible use of critical materials. Call your nearest G-E lamp office. Or see your G-E lamp supplier or your electric service company. General Electric, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS

GENERAL ELECTRIC

Set No. 26 External Gear Measuring Wires for use with new simplified gear measuring system.





SIMPLE, RELIABLE, SUPER-ACCURATE!

Van Keuren GEAR MEASURING SYSTEM

Simple! . . . The only calculation required is one of simple division.
Reliable! . . . The system is based on formulas approved by the American Gear Manufacturers Association.

Super-Accurate! . . . Van Keuren Gear Measuring Wires are accurate to within 25 millionths of an inch for roundness and exact size.

Van Keuren gear measuring tables give the measurements (M) over the wires (G) for 1 diametral pitch gears of correct pitch diameter (PD). The only calculation required is to divide the measurement for 1 diametral pitch by the diametral pitch of the gear being measured. The tables are complete for gears from 10 to 171 teeth and for pressure angles of 14½° 17½°, 20°, 25° and 30°. The tables provide for measuring both external and internal gears. They are far more accurate than anything previously available. No interpolations are required.

Write for catalog No. 31, giving full details, complete tables and instructions for their use.

Ultimate Accuracy

Our Catalogue No. 31 is a manual of precision measuring systems, giving complete tables and simplified formulae for measuring all standard threads, splines and spur gears. Send for this valuable handbook.

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

24th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages

Measuring Wires • Thread Measuring Wires • Screw Measuring Sets

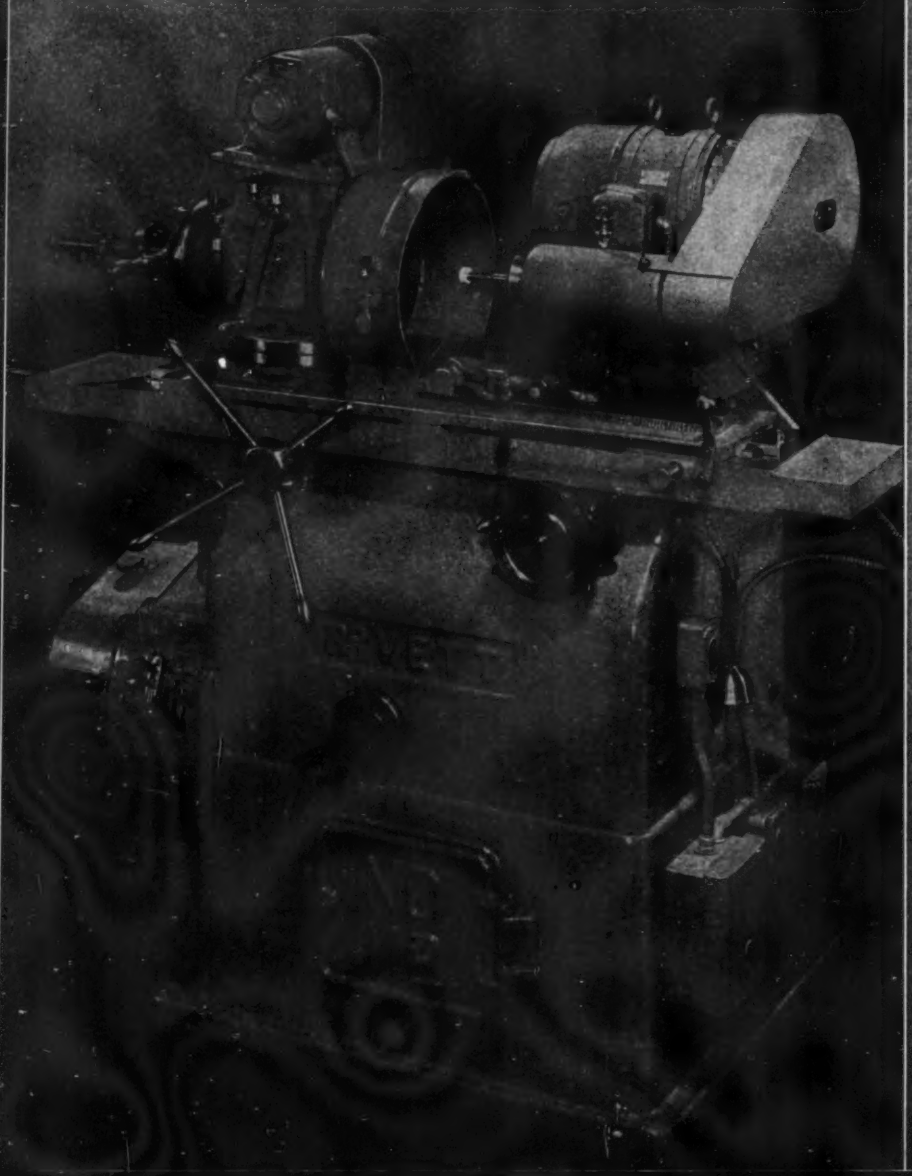
RIVETT

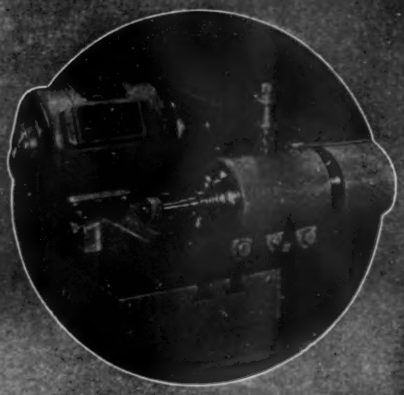
112 UNIVERSAL GRINDER

For Straight, Taper, Bevel or Straight and Bevel Grinding

The Rivett No. 112 Universal Precision Grinder is primarily for tool-room work. Available internal and external spindles in combination with many adjustments make possible a great variety of grinding operations. Extreme simplicity of design enables any mechanic familiar with grinding to operate the machine.

Work may be held in collet, step chuck, jaw chuck or fixture and driven at required speed. Power table reciprocation may be set at one of eighteen selective speeds from 10 to 36 passes per minute. Length of table travel is variable and may be set between ½" and 8". High or low speed internal spindle bracket or external spindle bracket, all as illustrated, may be quickly mounted as required on cross slide. Workhead, table and cross slide are swivelled individually or in combination for taper and bevel grinding.





High Speed Internal Spindle

External Spindle and Tailstock

SPECIFICATIONS

Grinding cap., hole dia.	⅛" to 8"
Grinding cap., outside dia.	up to 8"
Automatic table travel	½" to 8"
Table speeds	18 selective
Hand table travel	16"
Swing over table	14"
Workhead swivel	90°
Table swivel	5°
Cross slide swivel	90°
Cross feed graduations	.0005"
Travel of cross slide	8½"
Collet capacity	1"
Step chuck capacity	8"
Jaw chuck capacity	8"
Workhead spindle speeds	150, 380, 800 r.p.m.
Grinding spindle speeds:	
Standard int.	4600 and 10000 r.p.m.
High speed int.	25000 r.p.m.
External	3300 r.p.m.
Automatic Oil Lubrication	
Net weight with motors	3700 lbs.

For Further Description Write for Bulletin 112

RIVETT LATHE & GRINDER INC.

What do you do when a motor quits?

Well, frankly, you're in a jam.

You should, of course, take care of motors *before* they quit, by giving them the *little* maintenance so necessary to keep them on the job.

For example, let's consider Small Motors . . . those tiny, work-til-they-drop fellows who run your pumps, fans, appliances, and so forth. How long has it been since you gave them a little care?

It's so easy to keep your Small Motors in A-1 shape, happy at their job. Just be on the alert for their common enemies . . . friction, dust, moisture, vibration, overheating, noise.

If your Small Motor is already suffering from "ill-motor health", diagnose the symptoms and get it running again. Probably it's only suffering from a very common ailment.

We have just prepared a new Small Motor Maintenance booklet. It tells you how to protect your motors from their enemies, what to do when they attack. This new booklet is so chock-full of sound information that you will value it from the very moment you receive it.

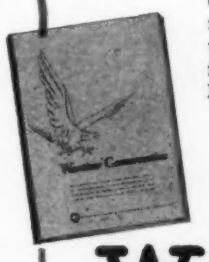
For example, what would you do if your Small Motor failed to start? There are 13 possible "reasons why" and this new booklet tells what to do about each. You'll find it easy to understand; profusely illustrated; complete with maintenance details.

Keep those Small Motors on the job—our country needs them! Let us send a free copy of this booklet for each maintenance man in your factory or shop. No obligation. Just tell us how many you need. Ask for B-3215. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-90473

3 Reasons Why We Must Make Electrical Equipment Last Longer

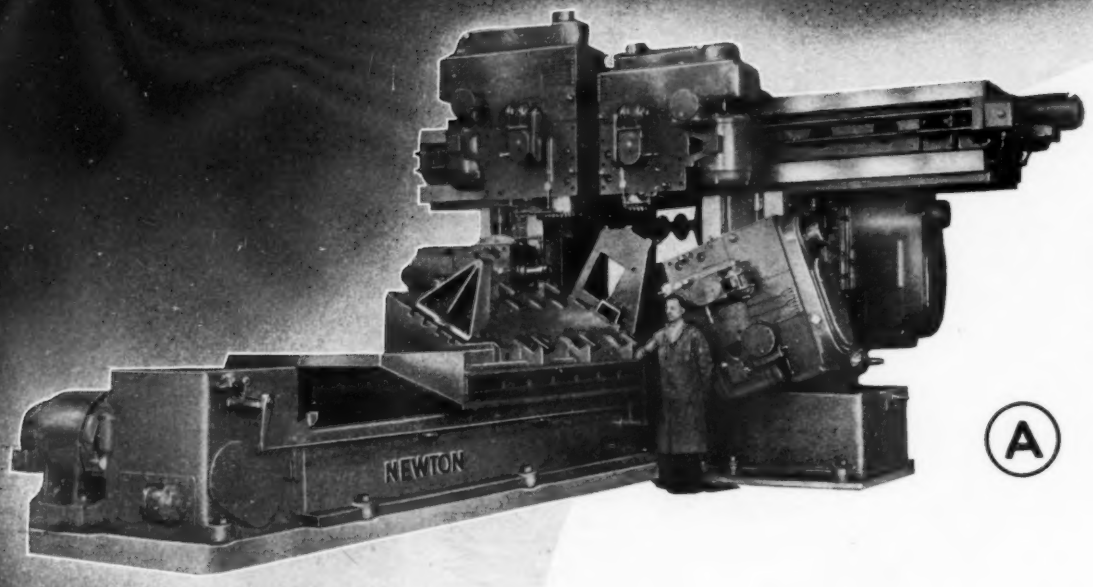
The more we save critical materials and the faster we produce, the sooner these birds will get it in the neck. Here's a book that's a real help. It's the new 100-page Westinghouse "Wartime Conservation" Book. Full of wartime information, it contains recommendations to save critical materials when selecting, applying, or using electrical apparatus. Write (company letterhead, please) for your copy. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.



Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

small motors

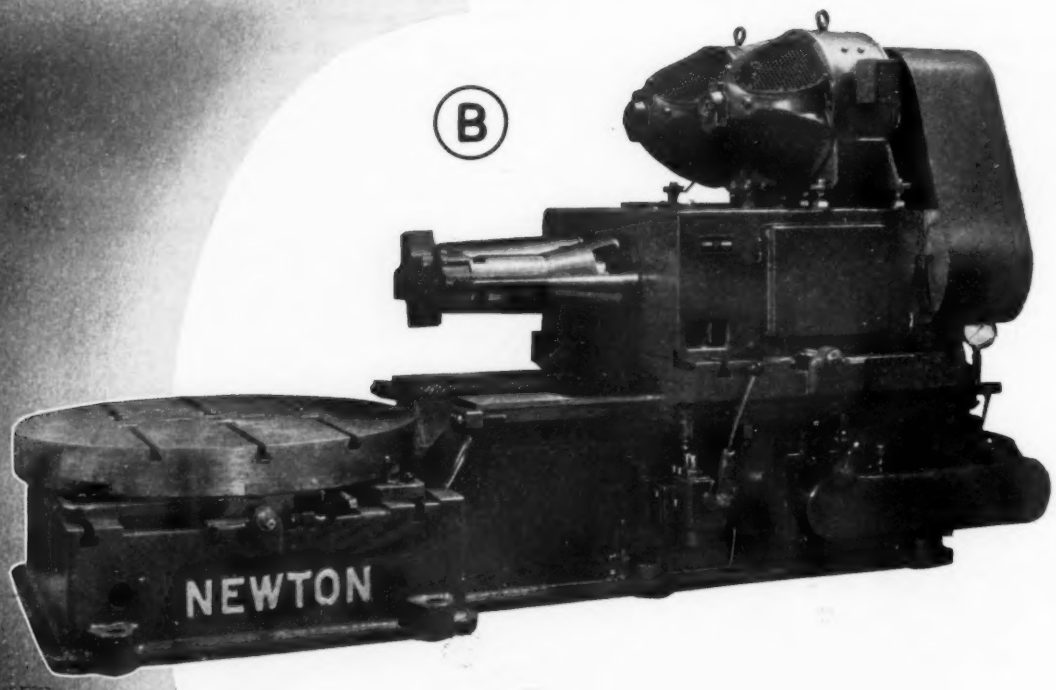


A

Navy E Pennant awarded September, 1941

Army-Navy E Pennant—Two Stars awarded September, 1942

Army-Navy E Pennant—Three Stars awarded March, 1943



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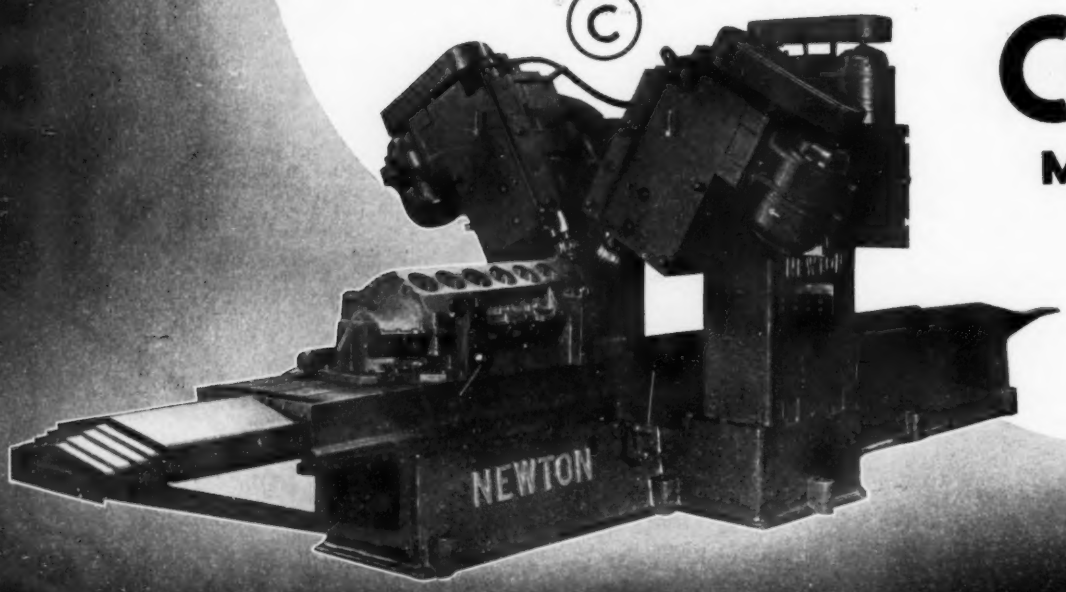


C

CONSO

MACHINE TOO

ROCHESTER

NEWTON

FOR BIG JOBS · FOR TOUGH JOBS

These NEWTON Milling and Boring Machines were designed by Consolidated Engineers and built to perform operations on heavy castings and forgings.

(A) Planer Type Milling Machine with Unit Heads for rough and finish milling and boring heavy Diesel Engine Crankcases.

(B) Boring Machine designed for boring compressed air cylinders for locomotives.

(C) Planer Type Milling Machine for finish milling aluminum aircraft crankcases.

(D) Vertical Milling Machine for profile milling locomotive rods and motion parts.

The use of NEWTON UNIT HEADS offers almost unlimited opportunity to modify or change these machines over to suit many different types of work.

IDATED

CORPORATION

NEW YORK

STARVING *in the midst of* PLENTY ?

To listen to most folks, you'd think America was starving. There is plenty to eat. The fighting men must be fed. So we, at home, get less coffee, sugar and butter. That may help some of us in industry appreciate why we can't get all the *materials* we would like.

In the matter of Welding Electrodes, for example, there never was a time when anything that approached today's production poured forth. That goes for PAGE, too, where tremendous volume of electrodes for welding Stainless Steel and Armor have swelled the total. *But fighting equipment comes first,* as PAGE still sees it.

So we continue to suggest you make it a daily *must* to see that the best welding practices are followed. See that welders have the most economical electrodes for the job, that no excess metal is deposited in the weld, that every bit of every electrode is used.

PAGE WELDING ELECTRODES

PAGE STEEL AND WIRE DIVISION

Monessen, Pa., Atlanta, Chicago, New York, Pittsburgh, San Francisco, Portland

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT · CONNECTICUT

ESSENTIAL PRODUCTS . . . TRU-LAY Aircraft, Automotive, and Industrial Controls, TRU-LOC Aircraft Terminals, AMERICAN CABLE Wire Rope, TRU-STOP Brakes, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Castings, CAMPBELL Cutting Machines, FORD Hoists, Trolleys, HAZARD Wire Rope, Yacht Rigging, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

FINISH TURNING TANK SPROCKET SHAFTS on SPARKS

Semi-Automatic Hydra-Feed MANUFACTURING LATHE

Mass production achieved by hydraulic operation and versatile tooling . . .

By combining the principles of hydraulics with basic principles and multiple-tool set-up of the automatic lathe, SPARKS achieves ease of operation, assured accuracy and reduced floor-to-floor time.

The set-up shown here—for the finish turning of tank sprocket shafts—involves the use of both front and back tools. The shaft is 44″ long with an average diameter of 5½″. Work is held in compensating chuck and live tail-stock center. Carriage is 42″ wide. There are three individually controlled back slides and two individually controlled front cross slides.

TOOLING and OPERATIONS

Eight front tools finish turn six different diameters. Seven back tools are used as follows: four tools perform facing operations (one of which handles both facing and cutting diameter); two handle grooving; one performs a chamfering operation.

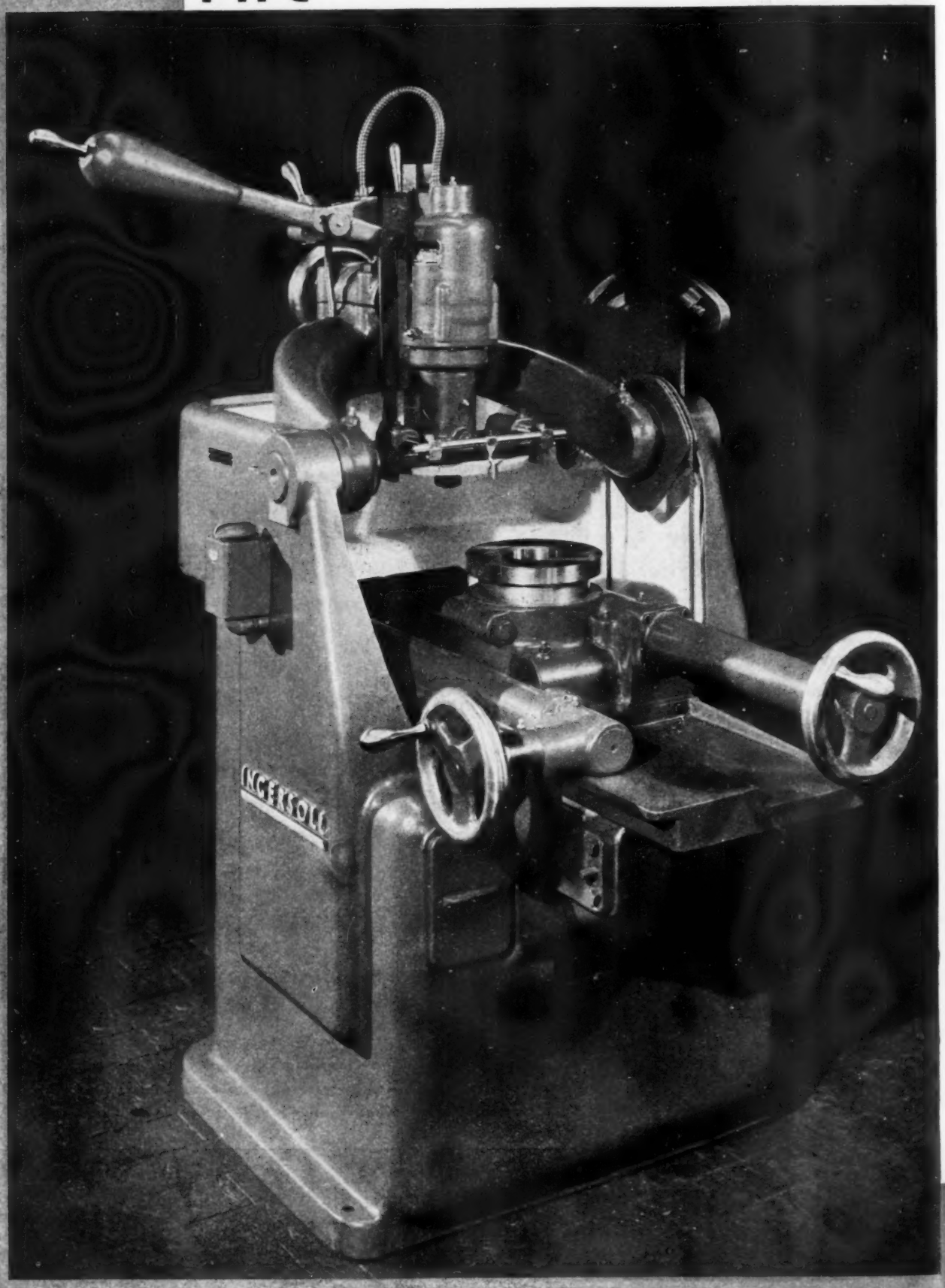
SPARKS Design Lends Itself to a Wide Range of work

Tooling-up for special purpose work is made possible and practical with SPARKS design and construction and involves carriage, cross slide, tool slide, tool blocks and cam. If your problem is one of mass production and calls for a minimum of attention on the part of the operator, ask SPARKS engineers to help you solve it.

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.

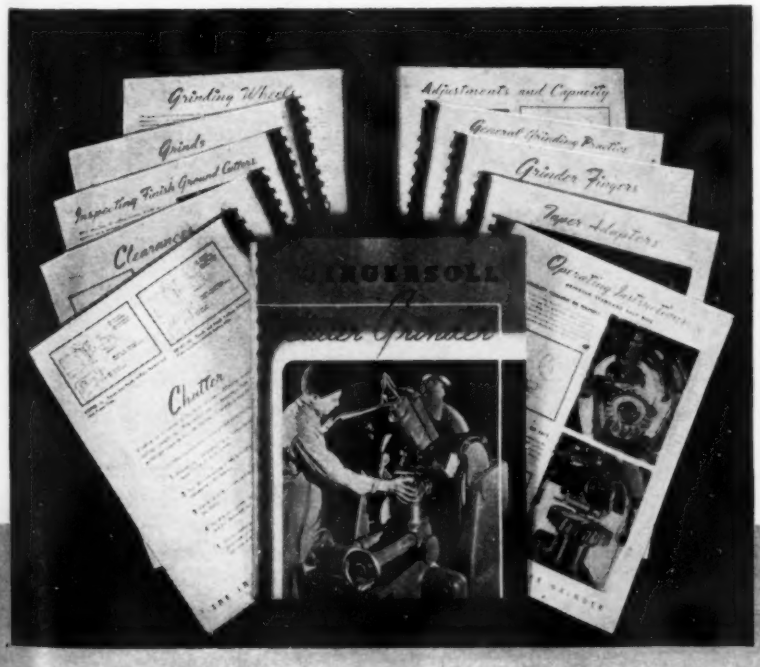
THE INGERSOLL

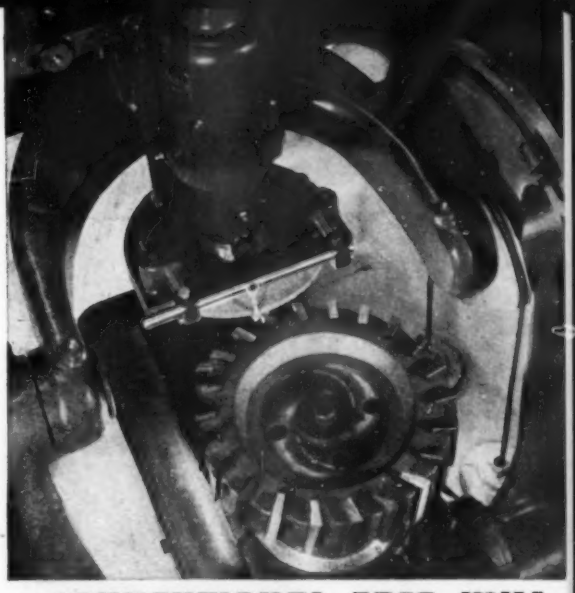


THE INGERSOLL MILLING MACHINE CO.

CUTTER GRINDER

THE INGERSOLL CUTTER GRINDER is particularly designed for grinding Face Milling Cutters. It grinds at a single setting of the cutter the face, periphery, and corners of cutters from 4 inches to 30 inches in diameter and having a maximum peripheral face of 7 inches. It will also grind solid shank, radius, staggered tooth, and angular inserted blade cutters. It is fast, accurate, and may be operated by the average mechanic. The technique for grinding milling cutters is simple and easily followed when thoroughly understood.

THE NEW MANUAL pictured below shows, through illustrations, the wide range of application of this machine and assists the operator in the best methods of grinding. A copy of this interesting book will be mailed to you upon request.

ROCKFORD, ILLINOIS



CONVENTIONAL FACE MILL

INGERSOLL SHEAR CLEAR

DOUBLE ANGULAR CUTTERS

What it means when the Army and Navy

TAKE IT TO TAFT-PEIRCE

Since well before World War I, the Army and the Navy have taken to Taft-Peirce many diverse problems in production of the tools and weapons of war. Taft-Peirce regards these military assignments in the same way that orders of the day are regarded by a fighting force, and has always made every effort to fulfill them to the E degree.

To the regiments of production soldiers in the Taft-Peirce plants, the Army-Navy Joint Production Award has a special significance, and brings a special pride. By the Excellence and faithfulness of their work, which has won the E Flag, these men and women have made the highest pledge of allegiance to the Flag that flies above it.

THE TAFT-PEIRCE MANUFACTURING COMPANY

WOONSOCKET, RHODE ISLAND

Manufacturers of Machine Tools... Small Tools... Gages... Reamers... Magnetic Chucks... Aircraft Service Equipment • Contract Manufacturers of Tools and Special Machines

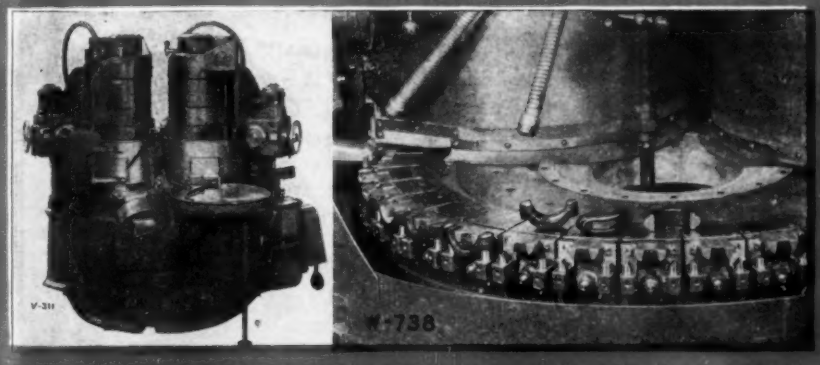
"PUT IT ON THE BLANCHARD"

ONE operator on this No. 16-A2 Blanchard Automatic Surface Grinder produces 1970 steel connecting rod caps per hour, ground on the joint face. He can load and unload the 34 station automatic clamping fixture as the stations pass in front of him. The wheel control calipers take care of the sizing automatically.

.040″ to .070″ of stock is removed from these connecting rod caps to limits of ±.001″. A minimum of 90% flat bearing surface is produced.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.



Grinding Connecting Rod Caps on No. 16-A2 Blanchard Automatic Surface Grinder.

BLANCHARD

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

★ **Production**

Adaptability

Fixture Saving

Operation Saving

Material Saving

Fine Finish

★ **Flatness**

Close Limits

★

. . . . . *Especially valuable on jobs like the one illustrated.*

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

NEW TOTALLY ENCLOSED TRI-CLAD MOTOR

FULLY ARMORED AGAINST THE ENTRY OF DESTRUCTIVE MATERIALS—RESISTANT TO CORROSION AND EXTERNAL DAMAGE

On this new member of the Tri-Clad motor family, end shields and frame are solid cast iron, smoothly contoured and tightly fitted. Ball bearings are protected by a rotating-labyrinth bearing seal—against damaging dusts or liquids. The leads are sealed in compound in a cast-iron pocket in the frame. Inside, the motor has all the extra-protection features of Tri-Clad open motors, such as Formex* wire.

An outstanding feature of these new motors is that their mounting dimensions are interchangeable with those of open motors of like rating.

For complete information on the totally enclosed Tri-Clad, see your G-E representative, or write to General Electric Co., Schenectady, N. Y.

*Reg. U.S. Pat. Office

FRAME SIZES

Hp	Rpm	Poly-phase	Single-phase
1/2	900	204	
3/4	1200	203	204
3/4	900	224	
1	1800	203	203
1	1200	204	
1	900	225	
1 1/2	3600	203	203
1 1/2	1800	204	204
1 1/2	1200	224	
2	3600	204	204
2	1800	224	

FOR "CRUEL" SERVICE CONDITIONS LIKE THESE

(Meeting requirements of WPB Motor Conservation Order L-221)

DESTRUCTIVE DUSTS*

Where rock dust, metal filings, powdered chemicals, or other finely divided materials are present in destructive quantities.

CORROSIVE FUMES*

Where motors are exposed to corrosive acids and alkalies in liquid or vapor form, such as on mixers in chemical pilot plants.

GUMMY, VISCOUS MATERIALS

In working with paints, oils, syrups, and other materials which might "gum up" the interior of an open motor.

SUPERSATURATED ATMOSPHERES

Where motors must operate without fail in areas filled with steam, water vapor, oil droplets. Also out of doors in humid, stormy climates.

* In addition to this *standard* totally enclosed Tri-Clad motor, G. E. can furnish *explosion-proof* types, tested and listed by Underwriters' Laboratories, Inc., for (1) hazardous dusts, such as magnesium dust, coal dust, grain dust, (2) hazardous fumes, such as gasoline.

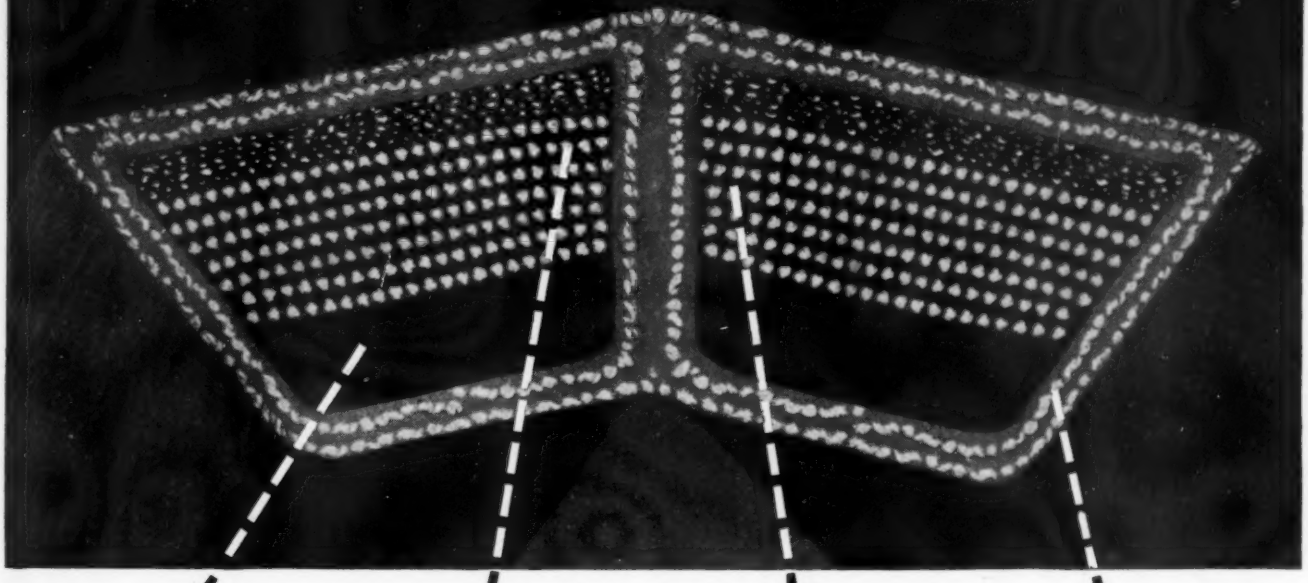
GENERAL ELECTRIC

750-214-8030

Open Book on WARTIME CARE OF V-Belts

Texrope Super-7's new Design-Against-Wear points to ways you can make V-belts last longer — whatever brand you use — saving equipment vital to victory!

V-Day needs every V-Belt



DESIGN VS. HEAT . . . Texrope Super-7's revolutionary new shock-absorbing rubber cushion contributes to cool operation.

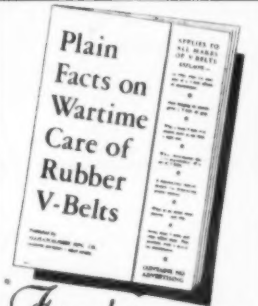
YOU can fight friction and heat by preventing misalignment. When present, it subjects V-belts to rubbing on their sides . . . builds up heat. So keep grooves in line — shafts parallel. And send in to Allis-Chalmers for "Plain Facts on Wartime Care of Rubber V-belts"; see p. 9.

DESIGN VS. STRETCH Texrope Super-7's 50% stronger cords produced by the new Flexon process combat stretching — plus the slip and heating that might result.

YOU can fight stretch — no matter what make of V-belts you are using — by promptly taking up any extra slack that may develop. Inspect drives regularly. See pp. 6 & 7 of Allis-Chalmers' new V-belt maintenance book for tips on proper tension.

DESIGN VS. BREAKS The 20% more cords built into the new Texrope Super-7 combat strains.

YOU can fight breaks by requiring that your V-belts never be pried into grooves — nor rolled from one groove to the next. Before installing or removing V-belts, the motor always should be moved forward. For added data, see POST MORTEMS, starting on p. 12 of "Plain Facts on Wartime Care of Rubber V-belts."



Free! Every engineer should have this important new handbook in his technical library. Applies to *all* makes — contains no advertising.

When you do need new V-belts, invest in the best . . . Texrope Super-7!

A 1542-A

ALLIS-CHALMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

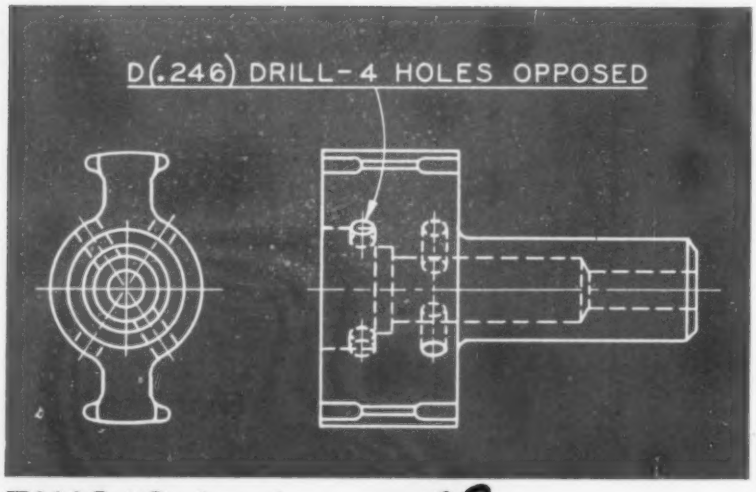
TEXROPE* SUPER-7 V-BELTS

*Trade mark registered U. S. Patent Office. Texrope Super-7 V-Belts are the result of the cooperative research and design genius of two great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers. Available in all sizes.....½ h.p. to 2,000 h.p.

There are 2 ways to do this job—

1. The EXPENSIVE WAY . . . or

2. The FLEXIMATIC *by KINGSBURY*

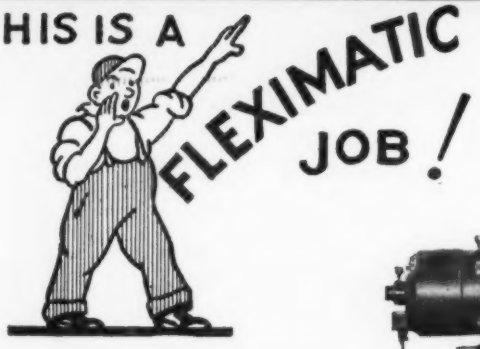


WAY

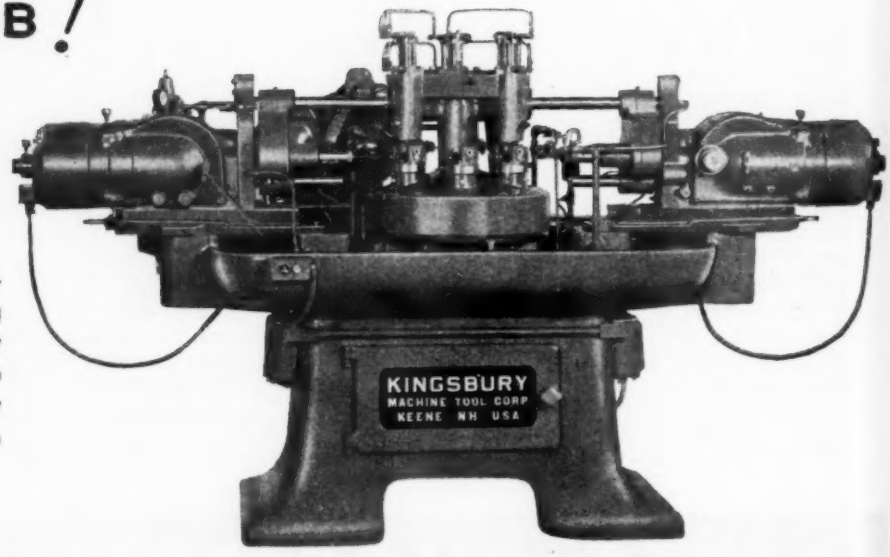
The expensive way to drill the four opposed holes in this shock absorber part would be to use a general-purpose drilling machine. Production would be limited to one hole at a time and by operator skill in manual indexing, etc.

The FLEXIMATIC way uses standard Units set up on a standard base around an automatically indexing turret. The only manual operations are loading and unloading, and even as these are being performed the Units are drilling work already loaded.

FLEXIMATICS combine the speed and efficiency of a special purpose machine with the valuable advantages obtained by their flexible set-up.



Standard Kingsbury Units for drilling, reaming, boring, spot facing and many milling operations may be mounted in any combination on standard bases and readily changed over to manufacture a wide variety of parts.



KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

THE SUPER SERVICE RADIAL

Here's a well-known Machine Tool, well-known for its rapid, low cost, high precision, quality work! The features of the Super Service Radial make this machine ideal for war-production plants where continued service for 24 hours a day, 7 days a week, is routine practice. The Super Service Radial is illustrated above, set up for line-reaming landing gear trusses, at one of the Douglas Aircraft plants. This job calls for extreme accuracy; two trusses are located in the jig by means of plugs inserted through reamed holes to maintain in-line accuracy of both parts. Consistently accurate performances of this nature are characteristic of the Super Service Radial.

List of features will be sent upon request.

ARMY E NAVY

SUPER CB SERVICE

THE CINCINNATI BICKFORD TOOL CO. OAKLEY, CINCINNATI, OHIO, U. S. A.

Something Hitler never thought of..

. . . that America has machines. With them, Americans can produce more and so earn more. With efficiency, ambition *and machines,* there's no limit to an American's opportunity.

That *opportunity*—open to no other people on earth—is what Americans are willing to fight for.

Hitler never thought of that. He boasted that Americans would sabotage their tools to join his European way, where government does your thinking for you, where you give up all liberty for a cheap and shoddy promise of so-called security. Hitler didn't know that Americans have ambitions for their sons.

The machines that *make* opportunity in America are here *because* that opportunity has existed. 40, 50, 60 years ago mechanics in scores of shops and attics dreamed better tools, worked untold hours to develop them, plowed profits back to build up the companies that make them. Without those machines we would have had no chance in this war; with them we will win it yet, because it is what machines can do for workmen that makes this country worth defending.

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

WHAT'S IN THIS ISSUE

LATHAM POLLOCK

THE CASE FOR CASING

The *Mustang*, North American's famed fighter plane, is now made at this company's Dallas plant. The tooling was designed by Latham Pollock, who had the experience of the N. A. Inglewood, Calif., plant to draw on. Not content to duplicate the Inglewood set-up, he devised a system of fixture fabrication based on the use of oil-well casing. In one of the first articles to appear on the fundamentals of aircraft tooling, Mr. Pollock tells how he retooled the *Mustang* and the reasons for his methods. Page 91.

SIMPLIFIED LARGE RADII CUTS

Aircraft manufacturers, and other producers using many parts of various radii will be interested in an article describing a method which will enable them quickly, accurately and inexpensively to make large radii cuts, while using a few ordinary tools. The method described offers greater flexibility, dispenses with the need for cumbersome, costly, swinging fixtures and is readily applied by the ordinary machine operator. Earl D. Rothrock is the author. Page 96.

STEEL SHELLS FROM SCRATCH

In the summer of 1941, General Motors' Buick Division was asked to experiment with the making of steel cartridge cases. Nine months later, after extensive work on tool design and metallurgical control, satisfactory samples were submitted to the Aberdeen Proving Ground, and production started July 12, 1942.

The Buick method "hot cups" a low carbon steel slug, putting it into a form that can be drawn readily into a cartridge case. A predrawing coining operation provides adequate elasticity. The problems connected with manufacturing the 75-mm. steel cartridge case, and Buick's tool drawings are part of the Armament Section. Page 121.

BOLTS FOR THE BOYS

The machining of rough forged breech bolts into finished ones for the Boys anti-tank rifle requires over 50 operations, while reducing the body from a 26-lb. forging to a 5-lb. finished part requires over 140 more. The steps required in machining breech bolts, and the ingenious methods used to expedite them, are described. Page 99.

REASON C. HOLLOWAY

THEY SAVE SCARCE TOOLS

Scarcity has made it imperative to break as few tools as possible and to repair those that are broken. Meanwhile, the addition to labor forces of hundreds of thousands of untrained workers has aggravated tool breakage. Reason C. Holloway, superintendent of portable tools, Linden plant of General Motors' Eastern Aircraft Division, has established standardized salvage practices for broken tools, on the basis of his previous experience with the Delco-Remy Division. In a two-page article he gives the prerequisites of his program, along with directions for making repairs to certain specific types of breaks. Page 102.

FILM AID FOR FIRST AID

The use of slidefilms to teach first aid makes it possible for students more quickly and thoroughly to absorb the necessary knowledge. Nineteen slidefilms, prepared with the cooperation of bureaus of the Navy, are now available as supplements to regular first aid training courses. Lyne S. Metcalfe, who draws from a background rich in pictorial, writing and motion picture experience to aid in the preparation of these slidefilms, writes of their value and use. Page 108.

LYNE S. METCALFE

AIRCRAFT WELDING IS DIFFERENT

Welding automotive steel is not sufficient preparation for similar work on light aircraft alloys, discovered officials of Eastern Aircraft Division of General Motors when they took over former Chevrolet plants and prepared to commence production of planes. To overcome this they gathered their welders and trainees into special courses, both in-plant and out, and trained them to meet the rigid Navy requirements. The training and the Navy tests are described. Page 112.

COMING

Piercing dies may be made lighter and more cheaply through a process combining use of plastic and metal. Due to their lightness, women workers can set them up in five minutes. And due to their simplicity of construction, unskilled workers can make them in considerably less time than that previously taken by skilled workers to make all-metal piercing tools. An article in an early issue will give the details of their construction.

The third of the training series designed to introduce new workers to machine shop tools will be devoted to milling, the machines, the tools and how each is used. It will be published soon.

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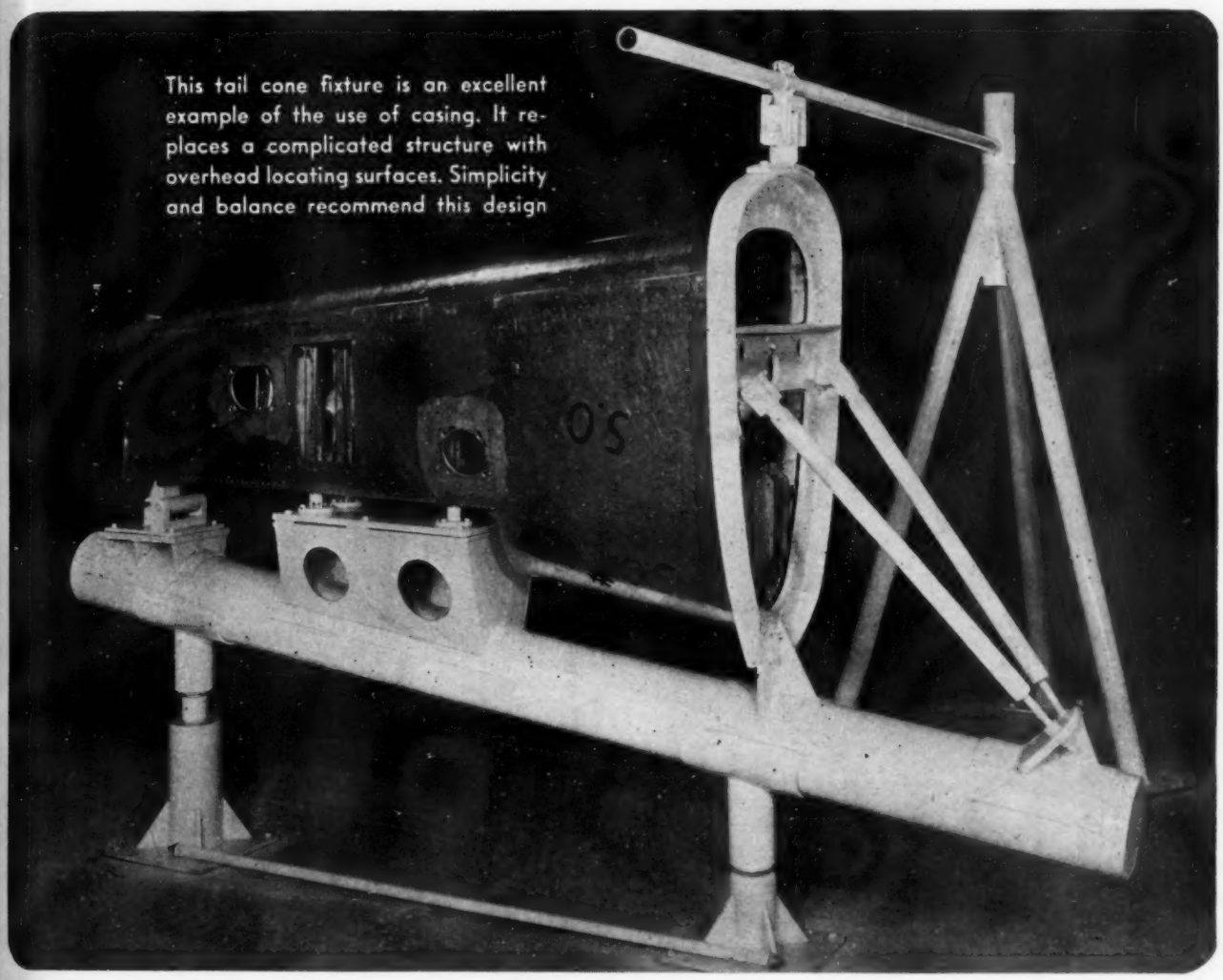
ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor



This tail cone fixture is an excellent example of the use of casing. It replaces a complicated structure with overhead locating surfaces. Simplicity and balance recommend this design

Steel Casing Retools the Mustang

Tool engineers in the aircraft industry have borrowed steel casing from the oil fields to build their fixtures. The results: clean design, easy fabrication and great rigidity

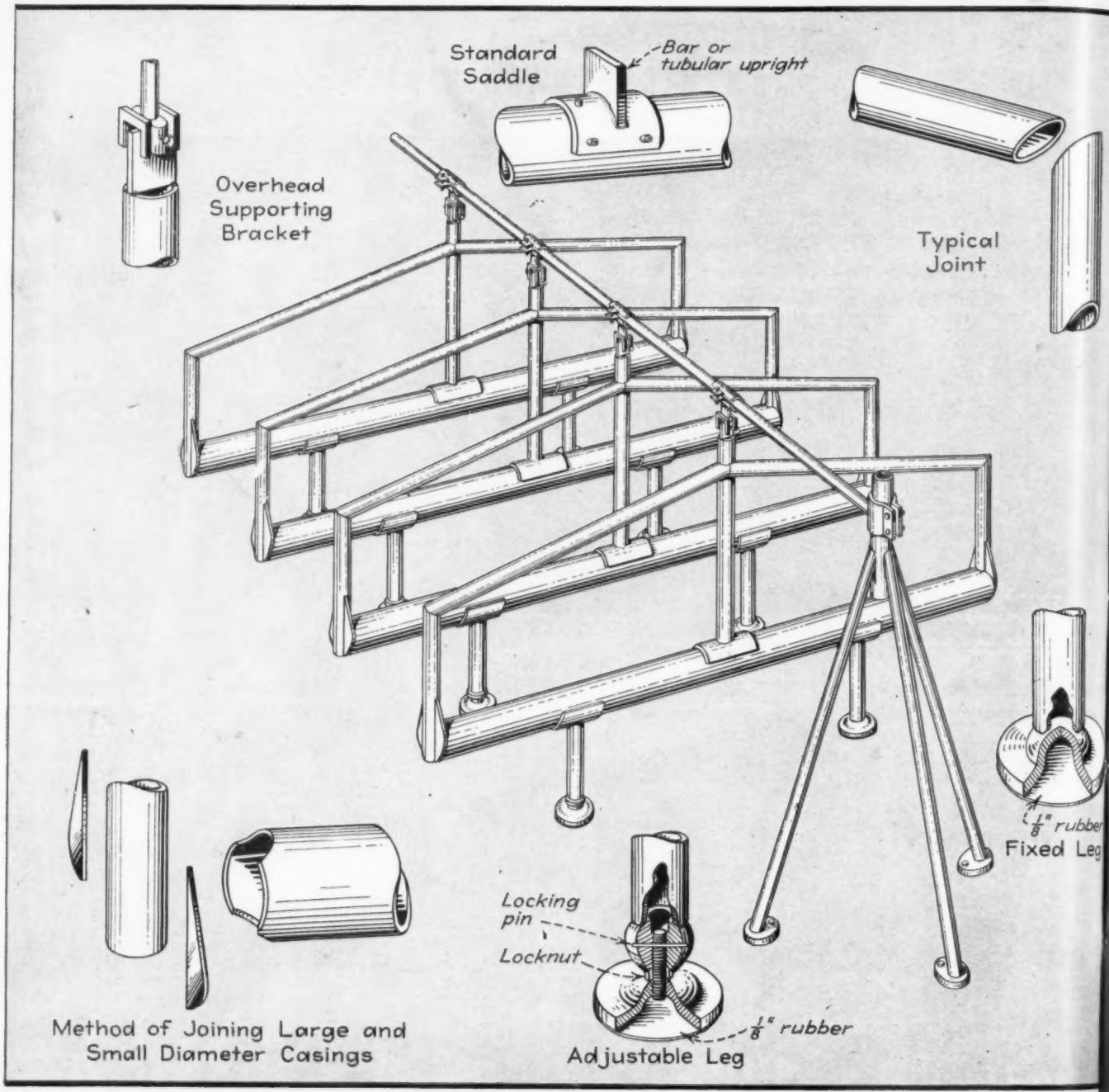
BY LATHAM POLLOCK, SUPERINTENDENT, NORTH AMERICAN AVIATION, INC., DALLAS, TEXAS

AIRCRAFT ASSEMBLY FIXTURES are always a good subject for an argument. The art of making them is so new and has moved so fast in the last three years that there are almost as many opinions about them as there are tool engineers.

The design of assembly fixtures is influenced by several things. Everyone will agree that a satisfactory fixture must be rigid and must maintain the alignment of all points which are to be held. The design is also influenced by the number of units to be fabricated, the availability of materials and the likelihood of change in the assembly under consideration.

Some designers like to use structural steel shapes, while others prefer cast steel frames; some swear by rectangular box sections, of rolled or welded construction; and still others believe there is nothing like steel casing. Advocates of all these materials back their convictions with logical arguments. But there is the case for casing.

Since one of the most important considerations is resistance to twist, the selection of a highly torque-resistant shape seems to be a logical choice. Most airplane sub-assemblies are fairly flat. Whether they are wing panels, fuselage side panels or stabilizers, the job is generally in two dimensions. Fixtures for assemblies of this type usually surround the part as a picture frame incloses a painting. But the fixture frame is not put there to be ornamental. Its chief



Three-point support for a battery of fixtures is obtained by mounting each unit on two ball-seated legs and an overhead clevis anchored to a common support. Fixture details reflect ease of fabrication through the use of casing

requirement is rigidity, and the first need of a flat frame is resistance to torsion. Since a hollow circular cross section has, weight for weight, a torsional resistance of over twice that of the next best shape that can be inclosed in the same area, one point is scored in favor of steel casing.

"But," question the flat-section enthusiasts, "What about fabrication? What about locating the tooling points? And what about supporting those pipe sections?"

The answer is that these considerations raise no more difficulty with casing than with any other steel shape. Indeed the hollow pipe section of this material offers many advantages in fabrication.

Fixtures for assemblies, whether of the flat panel type or three-dimensional, are just as readily made from steel casing as from any other shape. In fact, many times the fixture can be greatly simplified, since, instead of having to fabricate a structure to resist torque at some particular point, a pipe section of the proper size and weight may be selected which in itself meets the requirements.

The torsional strength inherent in steel casing means simplification of fixture design, since it needs less reinforcement and cross bracing. Casing comes in a wide variety of sizes, and sections large enough can be selected to give all the rigidity needed for any aircraft assembly job. It is readily cut with a gas torch and fabricated by arc welding. The strains set up by welding are more evenly distributed in casing than in any other section. This coupled with the fact that there is a minimum of welding required to fabricate these jigs results in a more nearly strain-free structure.

Fabrication of the frame brings up the question of locating points, which exponents of flat surfaces contend can be fixed more readily with their type of construction. But with casing the solu-

tion is simplicity itself. Short lengths of casing are cut into thirds or fourths, as may be required, and the resulting pieces are opened slightly by squeezing them under a press. The small increase in diameter forms a saddle which fits the outside of a frame member made from casing of the same initial size.

One or more flat steel fins are welded at right angles to the saddles; then the entire unit is doweled and bolted to the frame. The shape of the saddle permits it to be moved longitudinally or circumferentially to any point on the frame before doweling; the circular joint, together with the dowels and bolts, forms a rigid connection. Since the dowels and bolts are drilled straight into the pipe, they are not parallel but are at an angle to each other. This fact gives them a locking action and prevents them from loosening under vibration.

Practical Applications

The advantages claimed for the use of steel casing in aircraft assembly fixtures are not merely theoretical. They have been put to practical use in a number of plants and were employed in tooling for the Mustang (P-51) pursuit plane at the Dallas plant of North American Aviation. In designing the fixtures for this ship, a number of ideas were developed which lent themselves particularly to this kind of construction, but which may be used with other materials as well.

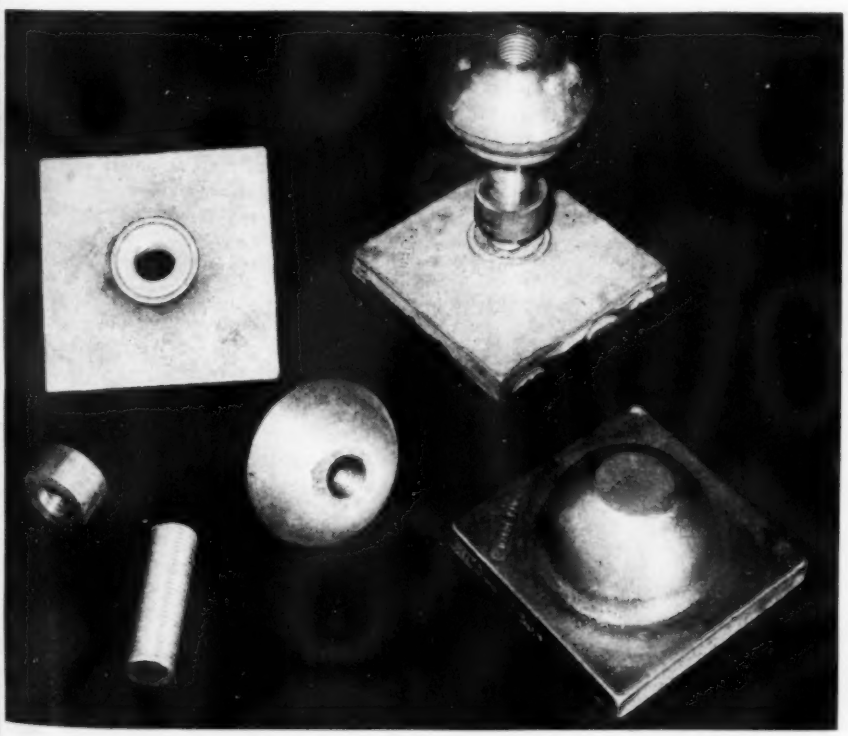
Where two casings of the same diameter are to be joined at an angle, each casing is cut at one-half the number of degrees of the required angle and the two ends of the pipe then butt-welded. In making a picture frame jig, it is best to select a section for the lower member that will act as a base for the whole structure; on this base should be located those points which it is most important to hold in the assembly. Instead of putting this base on the floor as is sometimes done, it should be brought as close to the work as is possible. Legs can be added to bring it to the proper working height.

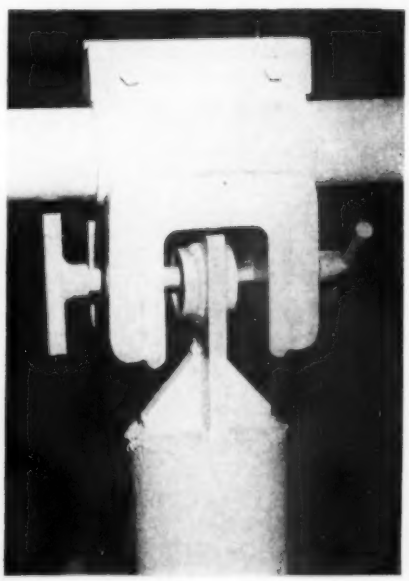
Overcoming Strains

Welding always sets up a certain amount of strain. If it is found that this is enough to make the fixture move, it can be overcome by peening the weld with a round-nosed set in a rivet gun.

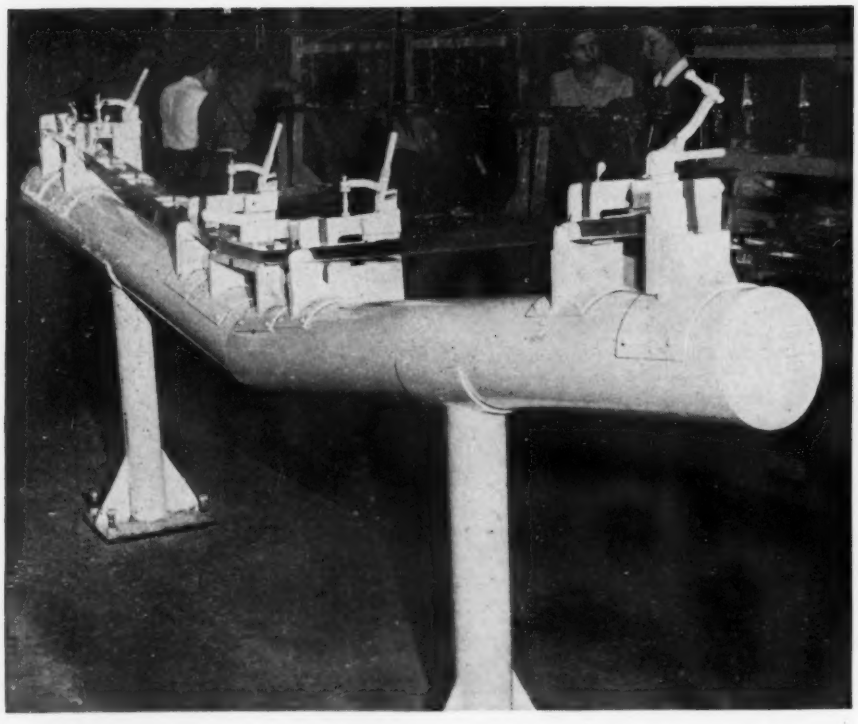
If the important points on the assembly are at an angle, the base section should be given the same angularity; thus, the greatest rigidity is obtained where it is most needed. Since the base is larger in diameter than the other members of the jig, the vertical members from the ends of this base are attached by cutting an arc in the ends of the base, so that the vertical members are recessed by half their diameters and then arc-welded. A gusset plate is then added, which covers the opening which is left in the larger casing. This gusset extends up the smaller pipe to a length approximately equal to the diameter of the larger member.

When the fixtures for the tail cone

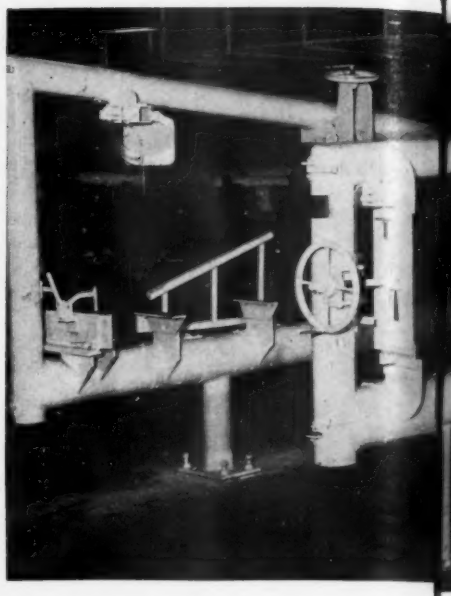




Details of three-point support. The fixed and adjustable legs are designed to receive the end of the casing. Note the rubber pads between the legs and the floor. Assembly fixtures are not bolted down. For the overhead support, a ring is welded on either side of the tongue which prevents it from slipping out in case the fixture is struck. The leveling screws allow some fixture float



Simplicity marks the design of the subassembly fixture for the horizontal stabilizer front spar. The steel casing follows the contour of the part thus giving maximum support to the locating points



Assembly fixtures for the wing leadi[ng. T]
edges reflect the clean lines and good a[ion;]
cessibility that result from the use of c[a uppo]

was designed, it was decided to assemble the tail cone in an inverted position, since this would permit the plate holding the empennage attaching points, which are important, to be mounted directly on the heavy base member of the jig. This arrangement eliminates the use of an overhead structure for locating these connecting points and greatly simplifies the fixture design. The fixtures for the control surfaces were made with an 8-in. casing for the base and 4-in. casing for the rest of the frame. The master assembly jigs for the wings were made with a 12-in. diameter casing for a base, and the leading edge points were located on this base.

Another idea is to make the fixture independent of the floor by using the principle of three-point suspension. In a new plant particularly, settling of the floor will throw fixtures out of line.

Positions for the Legs

To bring the fixtures to a convenient working level, the frames are supported on legs made of vertical pieces of casing. The legs are not placed at the outer ends of the fixture because this would permit the greatest possible sag between them, but are positioned at intermediate points to shorten the unsupported span. An imaginary line is drawn vertically through the center of the fixture. The legs are then placed at the approximate location of the point where each half of the jig would balance. The bottom of each leg is beveled around the inside diameter to fit a spherical surface cast in a floor plate.

Two such legs are usually employed —one fixed and the other with vertical screw adjustment. Neither leg is fastened to the floor. The floor plates rest on a pad of rubber about $\frac{1}{8}$ in thick. This prevents slipping and gives the floor plate an even bearing surface.

Beam Supports Fixtures

The legs give two points of support. The third point is overhead and is provided by a horizontal beam—made of casing, of course—to which are fastened a series of clevises for supporting a line of fixtures. Each clevis is provided with a pair of adjusting screws that are held against a vertical fin in the top of the fixture frame. The beam is anchored to the floor at one end by a steel support. Held by the spherical seats on the floor and the clevis screws at the top, the fixture literally floats. If accidentally struck by a shop truck, it is much less likely to be sprung out of alignment than a rigidly anchored structure.

Some might argue that cylindrical frame surfaces afford no place to lay tools or workpieces. One of the advantages of the use of casing for fixtures is that it cannot be made a resting place for accumulations of rivets or miscellaneous junk. If tool or parts platforms are required, they are built into the fix-

MUSTANG

July 27, 1942—Mustang fighter planes attacked enemy positions in Occupied France. A factory, troops, light gun positions, radio station and trains were raked by gun fire.

July 29, 1942—Flying at zero level, Mustangs had a "day out" in France. They successfully attacked freight cars, Army huts, barges and water towers.

August 19, 1942—In the Commando raid on Dieppe, Mustangs made sweeping attacks on enemy ground defenses; performed the task of visual reconnaissance; helped maintain a solid aerial umbrella over landing forces.

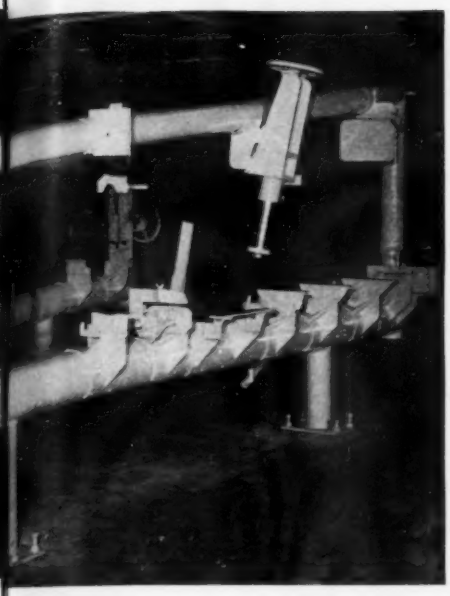
Oct. 15, 1942—While on special patrol, Mustangs of the RAF Army Cooperation Command damaged three small enemy vessels off the Netherlands. They also attacked barges, a freight train and railroad locomotives in Holland.

Oct. 21, 1942—Mustangs, flown by RAF pilots, became the first single-motored planes based in Britain to penetrate Germany. The squadron flew some 250 miles to attack German objectives in Holland.

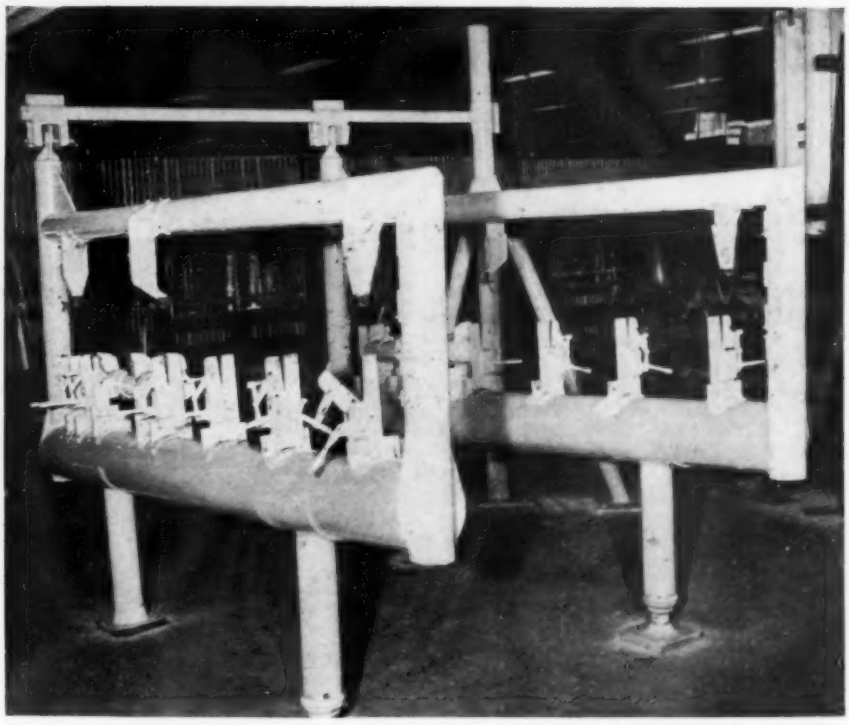
Nov. 21, 1942—Mustang fighters attacked ground targets in France, Belgium and Holland in a daylight raid.

Nov. 26, 1942—During a sweep over Northern Holland, the guns of one Mustang shot down a Messerschmidt 109 and a Junkers 52 troop carrier; with other Mustangs continued towards Den Helder; they attacked and set aflame two small supply ships.

Nov. 27, 1942—Mustangs attacked rail and water transport targets in Northern France and Holland, damaging several locomotives.



ng. These fixtures are not in their final location; hence standard leg and overhead supports have not yet been installed



Right and left assembly fixtures for the right and left aileron demonstrate the ease with which saddles for the toggle clamps are screwed and doweled to the frame at the desired locations

DIARY

Nov. 28, 1942—In continued attacks on transport targets, Mustangs destroyed a locomotive, damaged three others near Le Treport.

Nov. 29, 1942—Railway and other targets in Northern France and Holland were attacked by Mustangs.

Nov. 30, 1942—Locomotives were damaged in Northern France during operations by Mustangs of the Army Cooperation Command.

November, 1942—During November, British and Canadian pilots of the RAF, flying Mustangs over Northern France, the Low Countries and Northwest Germany, attacked and hit 42 railway engines, seven of which exploded.

Dec. 6, 1942—Mustangs, joining with 600 planes in an attack on German factories, airdromes, troops and communications, severely pummeled German troops, railroad installations, barges and shipping in the Netherlands.

Dec. 18, 1942—Mustang pilots of Army Cooperation Command damaged five railway engines in Occupied Europe.

Jan. 14, 1943—Mustang pilots concentrated on railway engines, freight trains and signal boxes in Northern France. Two engines and a freight train were damaged.

Jan. 23, 1943—For their part in the Allied 24-hour-a-day attack, Mustangs of the Army Cooperation Command in daylight raids over Northern France attacked 27 railroad locomotives, inflicted many casualties on German troops, and strafed a dredger and five barges.

ture by suitable brackets with wooden work surfaces.

In some fixture designs, casing has lent itself to the double use of frame and compressed air line. The air is piped directly into the sealed steel frame with outlet valves installed at convenient points. At the Dallas plant, however, this design was not employed because it was felt that the air pressure of 90 lb. per sq. in. might distort the frame and that moisture from the air would accumulate in the casing unless some means of drainage were provided.

The fixtures used in the Mustang are kept free from accessories. Air lines and electric conduit are carried overhead on independent hangers. Thus the fixtures serve the single function of holding components accurately during assembly. Insofar as possible, standard locating blocks and toggle clamps are used to position and hold the work.

Reference Lines Protected

After the fixture is complete, the reference lines are all covered with masking tape. The fixture is then sprayed with a light cream color, oil-resistant paint. The masking tape is not removed until, at some future time, the reference lines are required for checking.

From a design standpoint as well as in general appearance, these fixtures are exceptionally clean. Their cost in material and labor is no more, and usually less, than that involved in other types.

Shell-Case Die Standards

As the result of cooperative study by Army Ordnance and shell case producers, carbide drawing dies have been standardized so that a single basic die size can be used for all drawing operations from the first to the final draw on any type of shell case. It is also possible to start with a die for the final draw of a 37-mm. shell case, gradually recut it as the die wears to the first draw on the 37-mm., and when worn out for this operation, recut it to handle draws on 40-mm. shell case. Similarly, a single die size can be used for 3-in. anti-aircraft and 105-mm. shell cases. Standardization work is going on to permit interchangeability of dies between the 75- and 57-mm. cases. On the 20-mm. and the 90-mm. shell cases, one set of dies can also be recut for all draws.

For recutting of dies, an internal grinder is used with a 100-grit diamond wheel. The bearing is first resized to within 0.001 in.; the approach angle and radii are then reworked, using the same wheel. The wheel is replaced with a steel lap using a diamond powder, for lapping to size. Final polishing is with a buffing wheel using a fine diamond powder which should always be mixed with olive oil.

Large Radii Cut Without Special Tools

BY EARL D. ROTHROCK, VEGA AIRCRAFT CORPORATION

SURFACES that call for concave or convex contours of large radii can be quickly, accurately and inexpensively machined. The tools required are few and ordinary: a milling machine with an adjustable vertical head, a toolbit and a conventional flytool-holder, such as is found in any machine shop, and a simple holding device are all that are needed.

The tool and holding plate are mounted on the vertical head, tipped so the plane of the cutter travel intersects the plane of the mill table at an angle which varies according to the radius being cut. The surface generated by the cutting action of a rotating tool in this position, while the work mounted on the table moves past it, can be easily visualized in Fig. 1.

Views *A* and *B* represent front and end views, respectively, of a milling machine set up to cut a concave arc of large radius. *A* illustrates the plane of the cutting tool's travel with relation to the work table travel. *B* shows the elliptical path made by the cutting tool when intersected by a plane 90 deg. to the table.

Arc *a*—*a'* of this ellipse, on which the cut is actually made, can be made to coincide with the desired radius by adjusting the angle at which the plane of the cutting tool intersects with the mill table. Technically this would not be a true arc of the desired radius. However, it is so nearly perfect, that the microscopic deviation that is present cannot be measured without the use of extremely fine instruments, and it is far more accurate than can be cut with the average form cutter or swing fixture.

There are limits to the length and width of the surface that can be cut this way. The width being machined should not exceed 50 percent of the diameter of the toolholder being used, for beyond this center half the path of the cutting tool begins to enter the sharp radius at the ends of the ellipse. The length of a concave cut is limited only by the table travel of the machine on which it is being run.

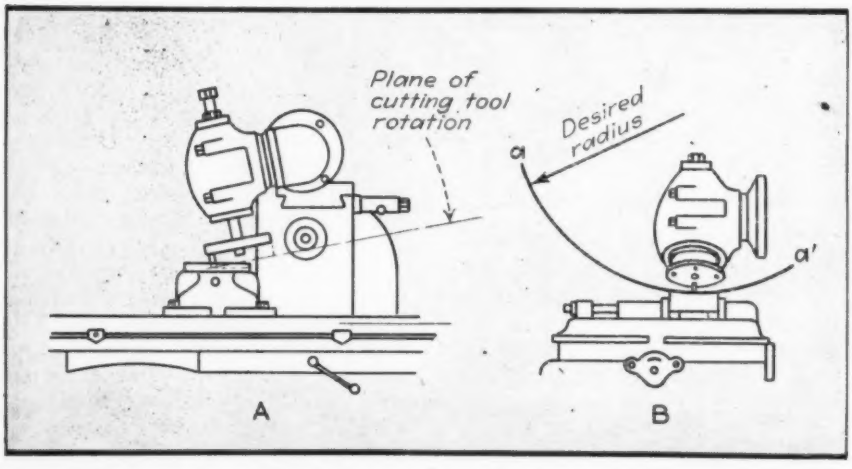


Fig. 1—Concave surfaces may be generated with a fly cutter by tilting the spindle of a universal milling machine

Rule for Convex Surfaces

In the case of a convex surface, however, the length must be short enough to be cleared by the cutter without striking the tool holder or entering the back sweep of the tool as shown in Fig. 2.

Parts most likely to require a convex surface, such as brackets, are usually short enough to be easily cut by this method.

There are three ways which can be used to make the set-up and get the desired result.

First: by setting up the job with a dial indicator.

Suppose, for example, it is necessary to put a 48-in. radius on a bracket.

ADVANTAGES OF THIS METHOD

A huge time saving. Set-up requires only 10 percent to 25 percent of the time a swinging device needs, while the actual running time is reduced as much as a half to a third. Also, as it is only necessary to remove the toolbit and sharpen it, the longer time and the equipment needed to grind any formed cutter is saved.

Expensive form cutters are dispensed with.

The holding fixtures are simple and inexpensive and replace cumbersome, costly, swing fixtures.

One tremendous advantage lies in its flexibility as the range of radii to which it can be adapted is unlimited.

Also the average man at the machine can readily understand, and use to full advantage, the procedure once it is pictured and explained to him.

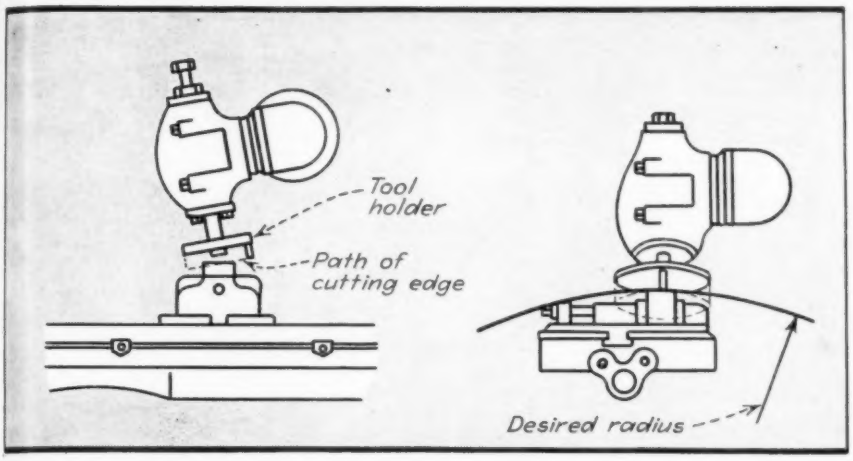


Fig. 2—The process may also be used on convex surfaces provided they are short enough to clear the cutter

Referring to Fig. 3, the procedure would be as follows:

The chord *C D* is 4-in. long, and its arc is to have a radius of 48 in. Bisecting the angle *B D C* gives two sides of a right triangle; that is, 48 in. and ½ of the chord, or 2 in. Solving the triangle gives the distance *E B*. Subtracting *E B* from the radius, the distance *A E* is found to be 0.042 in., which is the actual "depth" of an arc of 48 in. radius over a 4-in. width.

To Set the Milling Head

The next step is to position a dial indicator on the toolholder at the same distance from the center of the toolholder as the cutting tool. Then, using a flat surface 4-in. wide, such as a smooth forging surface or even the table of the machine itself, center the surface with the center of the toolholder. Tip the adjustable head until the indicator reads 0.042 in. at both extreme edges of the 4-in. flat surface and at the same time reads zero in the center, and lock the head. It will then cut an arc of 48-in. radius over a 4-in. width. It only remains to clamp the part so the side to be cut is available to the cutter and proceed with the machining.

Because of the speed and accuracy with which this set-up can be made, the ease with which it can be varied to accommodate different radii, and its basic simplicity, it is recommended as preferable to any other.

Second: setting up by finding the angle at which to tip the adjustable head.

Although at first glance it may appear that finding the angle at which to tip the adjustable head by mathematical solution would involve a complicated process, it is really comparatively simple and requires only three steps of ordinary trigonometry.

For the first step solve for the depth of the arc of the desired radius the same as described previously in solving for the distance *A E* in Fig. 3. It is important to remember that this distance is in the plane of the desired radius. For the second step, we know that the cutting will be done by that portion of the cutter's travel inclosed by a 4-in. chord.

Referring to Fig. 4 *A*, the depth of the arc of the cutting tool is found by solving for the distance *X Y*. Again it should be remembered that *X Y* is in the plane of the rotation of the cutting tool. Hence the definite relation between *A E* and *X Y*, as shown in Fig. 4 *B*, gives a third right triangle; the perpendicular is the distance *A E*, or the depth of the arc in the plane of the desired radius, the hypotenuse is the distance *X Y*, or the depth of the arc in the plane of the cutting tool rotation, and the angle *K* is equal to the angle at which the adjustable head is tipped. As the values of *A E* and *X Y*

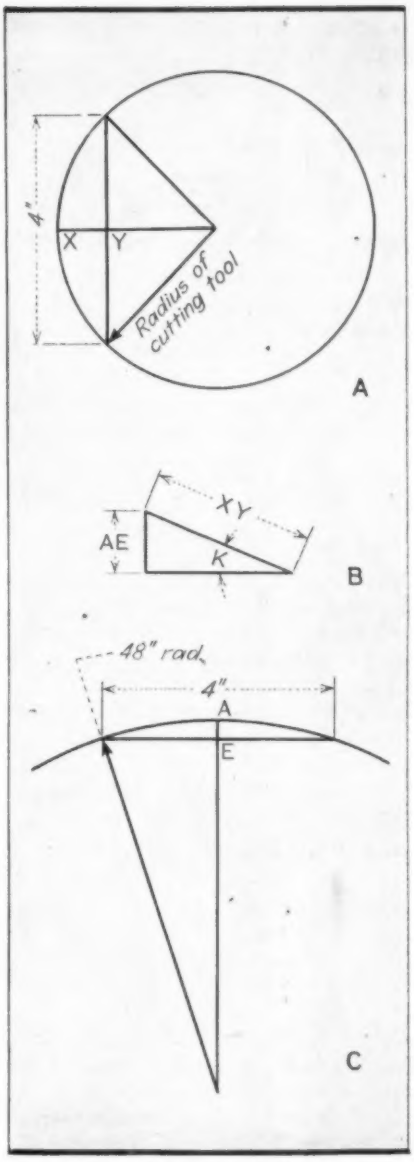


Fig. 4—An alternate solution is to determine the angle of tilt of the cutter by three trigonometric calculations

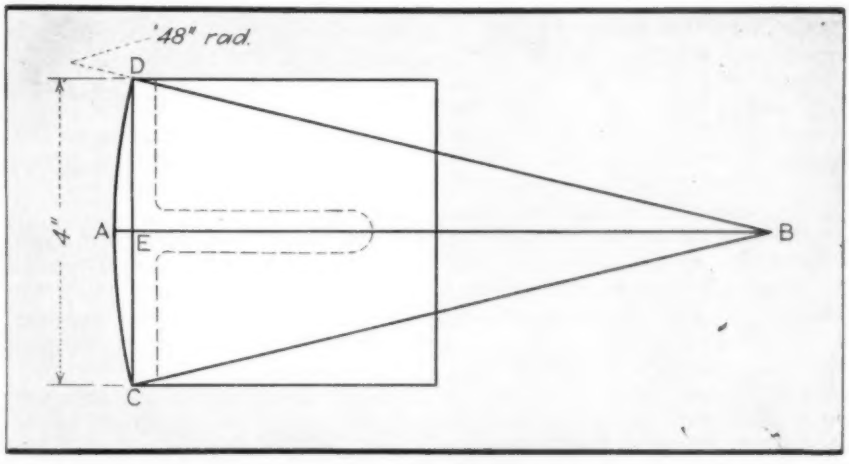


Fig. 3—Cutter settings may be calculated by solving the third side of a right angle triangle, to find the value of A E

are known, it is a simple matter to solve for the angle K.

These three steps can be combined in one formula:

where T = radius of cutting tool
R = radius desired
W = width of part to be radiused
To find K = angle at which head is tipped

$$\sin K = \frac{R - \sqrt{R^2 - \left(\frac{1}{2}W\right)^2}}{T - \sqrt{T^2 - \left(\frac{1}{2}W\right)^2}}$$

$$= \frac{R - \sqrt{\left(R + \frac{1}{2}W\right)\left(R - \frac{1}{2}W\right)}}{T - \sqrt{\left(T + \frac{1}{2}W\right)\left(T - \frac{1}{2}W\right)}}$$

Third: set-up by templet

A templet of the desired radius can be made. By taking a trial cut and checking with the templet, then adjusting the head and continuing this trial and adjustment, the arc can be made to coincide. This set-up is not any too accurate and also requires more time. It should not be used except where an indicator or vernier scale head is not available.

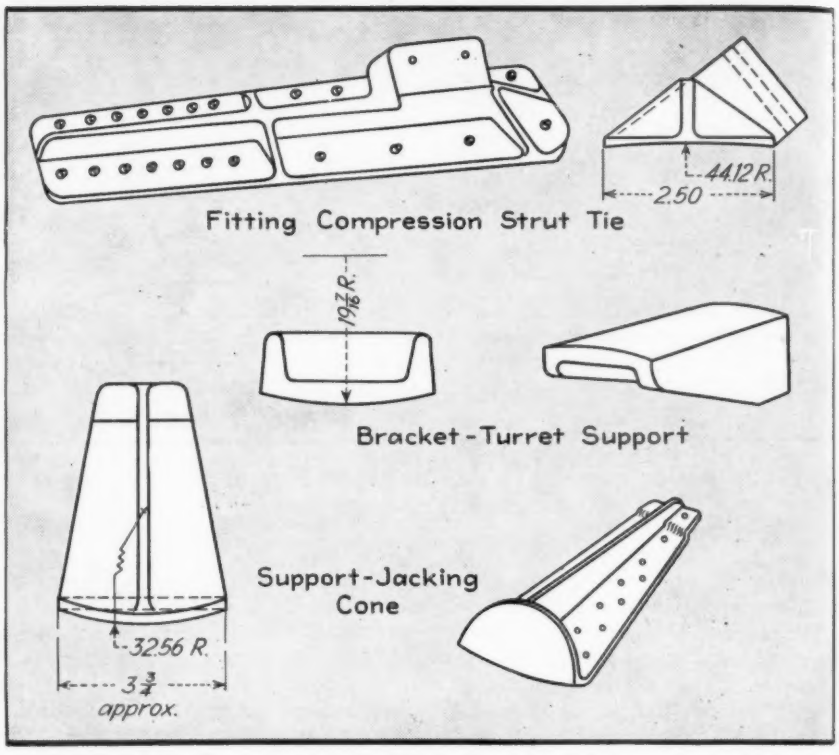


Fig. 5—Examples of aircraft parts show that the method may be applied to a wide variety of work

The Cost of Unsafe Tools

BY LESLIE CHILDS

ONE OF THE EASIEST ways for an industrial concern to get into trouble and perhaps suffer an unlooked for loss, is to require an employee to work with an unsafe tool. It is well to remember that any instrument, ranging from a power-driven appliance to a simple wedge or chisel, may constitute an unsafe tool if the employer has knowledge that it is dangerously unsuited for the purpose he requires its use.

In a case of this nature, the defendant, an industrial company, was having a number of railroad cars dismantled for salvage. The plaintiff, an employee, assisted by a helper was using an axe-like cleaver which he held by the handle, while his helper struck its head in cutting nuts and bolts that could not be removed by the use of a wrench. This cleaver broke; the plaintiff asked his foreman for another; then, as condensed from the report, the following occurred:

The foreman stated he did not have another cleaver and gave plaintiff a chisel 22-in. long to use instead. According to the plaintiff, he protested that it would be dangerous to use the chisel; the foreman replied that that was all they had, and plaintiff could either use it or go home. The foreman's version of the conversation differed somewhat from that of the plaintiff, but he admitted that he ordered plaintiff to use the chisel, and that the plaintiff obeyed the order.

While the plaintiff was holding the chisel against a bolt, his helper struck it with a 12-lb. iron maul, the bolt gave way; this caused the chisel to jerk forward, and the plaintiff's head came in violent contact with the chisel. Result, plaintiff suffered a head injury that soon caused him to become totally blind.

The plaintiff sued for damages, and was awarded a judgment for $30,000. The defendant appealed and the higher court said:

"The chisel and maul were both simple tools, but the danger to the plaintiff in the use thereof arose, not from any defect therein, but from the mode and manner in which he was required to use them. . . .

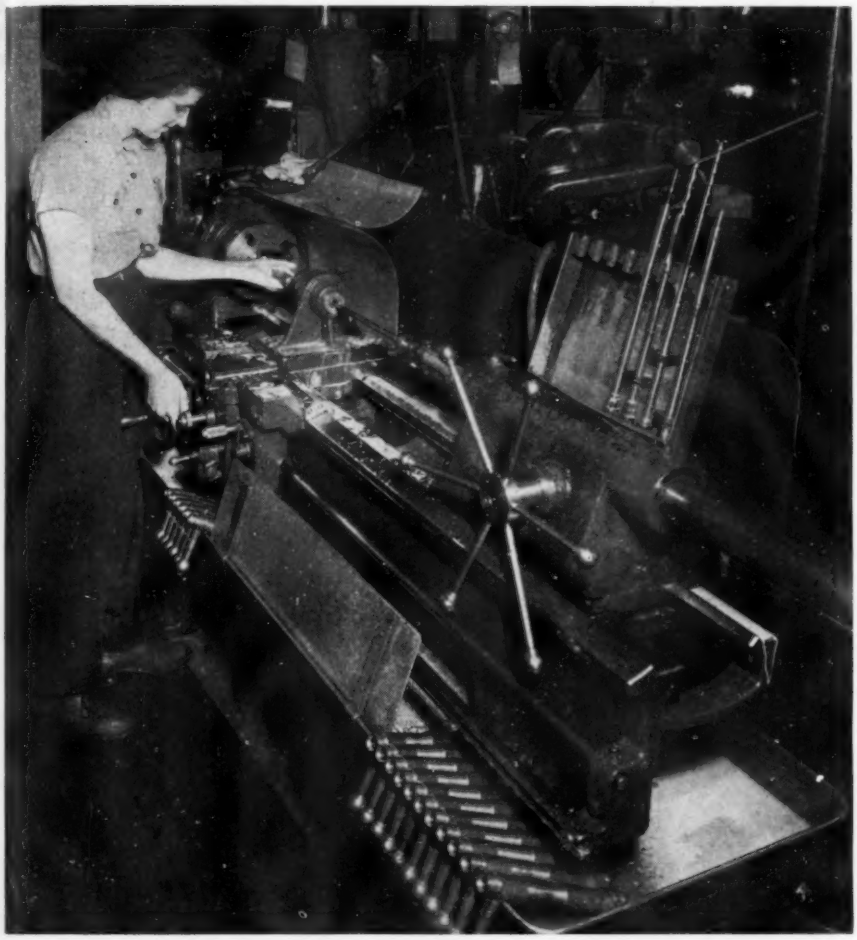
"This danger should be manifest to any one who knew the length of the chisel and that it was to be so used, but if not, the danger could have been easily ascertained by the exercise of slight care for that purpose, consequently the defendant's foreman was guilty of negligence when, over plaintiff's protest, he peremptorially ordered the plaintiff to use the chisel, with knowledge of the mode and manner of its required use. . . . The plaintiff was bound to obey this order, or risk being disciplined for insubordination.

"Under such circumstances, the master is not relieved of liability for an injury from the use of unsafe tools, although the servant may have been as competent as the master to determine the suitability thereof for the performance of the required work."

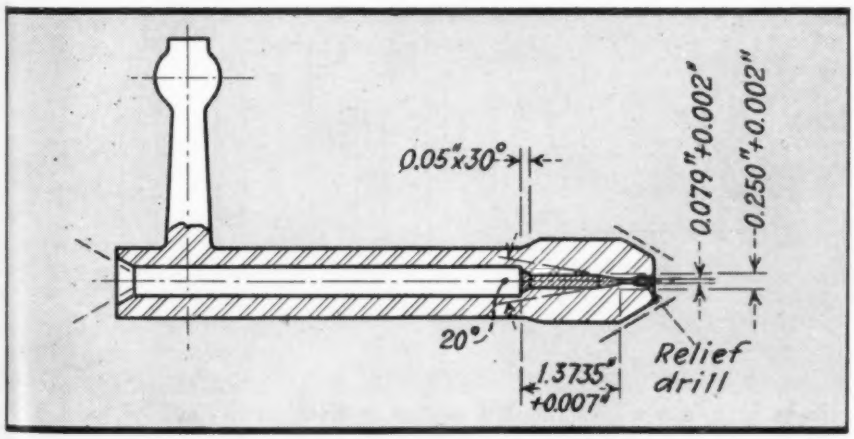
So ended the case with the defendant being held liable in the sum of $30,000 for the injury suffered by the plaintiff, this unusual amount, of course, being based upon the seriousness of the plaintiff's injury—total blindness.

True enough, the foregoing case was decided upon its particular facts and circumstances, as all cases of this kind are usually decided. However, this in no way detracts from its force and value as an example of judicial reasoning on the subject involved, and as the possible cost to an industrial employer of a slip-up in this phase of employee management.

Breech Bolts for Boys Anti-Tank Rifles



A standard LeBlond engine lathe was converted for drilling striker pin holes in Boys breech bolts by fitting a special tailstock and by removing the standard cross-slide from the carriage to permit mounting a special heavy-duty ball bearing steadyrest. The carriage now is used only to hold the steadyrest center against the part while guiding the drill through the steadyrest bushing



This sketch shows the striker pin holes drilled in the LeBlond lathe set-up for machining Boys breech bolts

MORE THAN FIFTY operations are required to transform a rough forged breech bolt into a finished item ready for assembly in the Boys anti-tank rifle now being manufactured in a large Canadian small arms plant. One of the first operations on this part is the drilling of a 0.600–0.603 in. diameter hole, 8-in. deep longitudinally from the back end of the bolt body. This operation is performed in a two-spindle deep-hole drilling machine in one operation, two forgings being drilled in each set-up. The hole must be accurately located and must be free of scratches, since it is used to locate all succeeding operations on the piece. V-bits used for drilling this hole are of the same type as those used for drilling the barrels for machine guns and rifles.

Following several rough-turning operations, the forward end of each breech bolt is coned in accurate relation with the bottom of the holes drilled in the breech body, and the rear end of the bolt is turned and coned concentric with the bore. These coned ends serve to locate the piece accurately while drilling the striker pin holes in a LeBlond engine lathe. As shown in an accompanying illustration, this lathe has been fitted with a special tailstock having a long spindle for feeding the drills, and with a steadyrest in place of the cross-slide on the carriage to guide the drills accurately and to support the rear end of the piece while drilling. The steadyrest consists of a large casting into which is fitted a ball bearing spindle having at the forward end a female cone center for supporting the piece and at the other end a hardened guide bushing to support the drill body. When the part is placed between the centers, the carriage is moved toward the lathe headstock and locked in position to hold the piece accurately.

Each of the six drills used for this operation are accurately centered in extensions that fit in the 0.600-in. hole in the bolt body so as to keep the striker pin holes accurately centered in the piece. Each drill holder has a quick-acting driver that fits in a holder on the end of the tailstock spindle. These drilling operations must be performed carefully, since all of the holes finished in this set-up must be concentric, and all of the drilled surfaces must be smooth and of accurate di-

ameter. Hand feed is used so the operator can feel the drill cutting. This is especially needed in drilling the small 0.079-in. hole concentric with the other internal diameters.

Next, the exterior surfaces of the bolt body are finish turned and ground, and then the bolt handle is turned. For this last operation an interesting tooling set-up has been developed for a Bardons & Oliver turret lathe. The faceplate on the spindle of the lathe has been fitted with a fixture which locates the piece from the bottom of the 0.600-in. hole in the bolt, and grips the turned and ground body in V-clamps, while the ball on the handle is located with its axis in line with the axis of the lathe spindle by a V-block carried at one of the positions on the hexagon turret of the lathe. With the piece set loosely on the arbor of the fixture, the turret is brought forward to catch the ball end of the handle in the locating block. Then the two clamps on the faceplate are tightened to hold the piece accurately in position.

The first operation in this set-up consists of drilling a center in the end of the handle, using a high-speed steel drill in the second position of the hexagon turret.

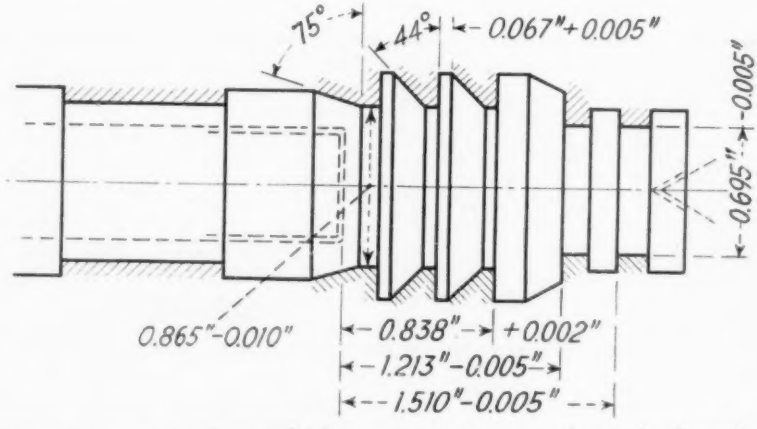
Form Turning the Ball

The next station on the hexagon turret carries a ball bearing center which supports the handle while the cross-slide is fed in by hand to turn the ball on the end of the handle with a high-speed steel form tool. This tool consists of a high-speed steel bit brazed on a mild carbon steel shank, so as to reduce to a minimum the amount of high-speed steel required for the set-up. When the ball form has been finished, the cross-slide is reversed to bring a single-point tool on the rear toolpost into position for taper turning the body of the handle. This rear toolpost is mounted on a secondary slide that is connected to a taper turning attachment. Power feed is used for this part of the operation, the rate that has been found satisfactory being 0.004 in. per rev.

A number of rotary milling operations, thread milling operations and cylindrical grinding operations finish the breech bolts. These include rotary milling cam faces at the forward end of the bolt body, rotary milling the handle to finish the tapered section, and rotary milling the resist grooves which lock the bolt in the body of the gun. For this last operation, six milling cutters are mounted in a gang on the spindle of the miller and complete the cylindrical cut in one rotation of the working spindle. A cam on the working spindle operates against a fixed roller on the bed of the machine to control the depth of cut. The 5-in. diameter cutters are rotated at 60 r.p.m. while the work is rotated at 1/5 r.p.m. In this operation, the location of the grooves must be held within plus or minus 0.001 in. while the angles are held within 0.5 deg. All of these milling operations, as well as the cylindrical operations which follow, are arranged to locate the work piece from the bottom of the 0.600 in. diameter hole in the body of the breech bolt that was drilled in the first operation on this steel part.

For grinding the faces of the resist grooves, as well as the root diameters of the grooves to tolerances of plus or minus 0.002 in. for spacing, the form wheel is used in a standard cylindrical grinder. The mandrels used for this operation again locate against the bottom of 0.600 in. hole in the body and these arbors are selected to fit the holes snugly. A series of mandrels ranging in size from the smallest diameter permitted for the holes to the largest diameter permitted are furnished each grinder set up for this operation. The ball

Breech bolts are clamped to the faceplate of a Bardons & Oliver universal turret lathe for turning the ball and tapered shank of the operating handle. As with other operations on these parts, the fixture provides for locating each piece from the diameter and bottom of the 0.600 in. hole

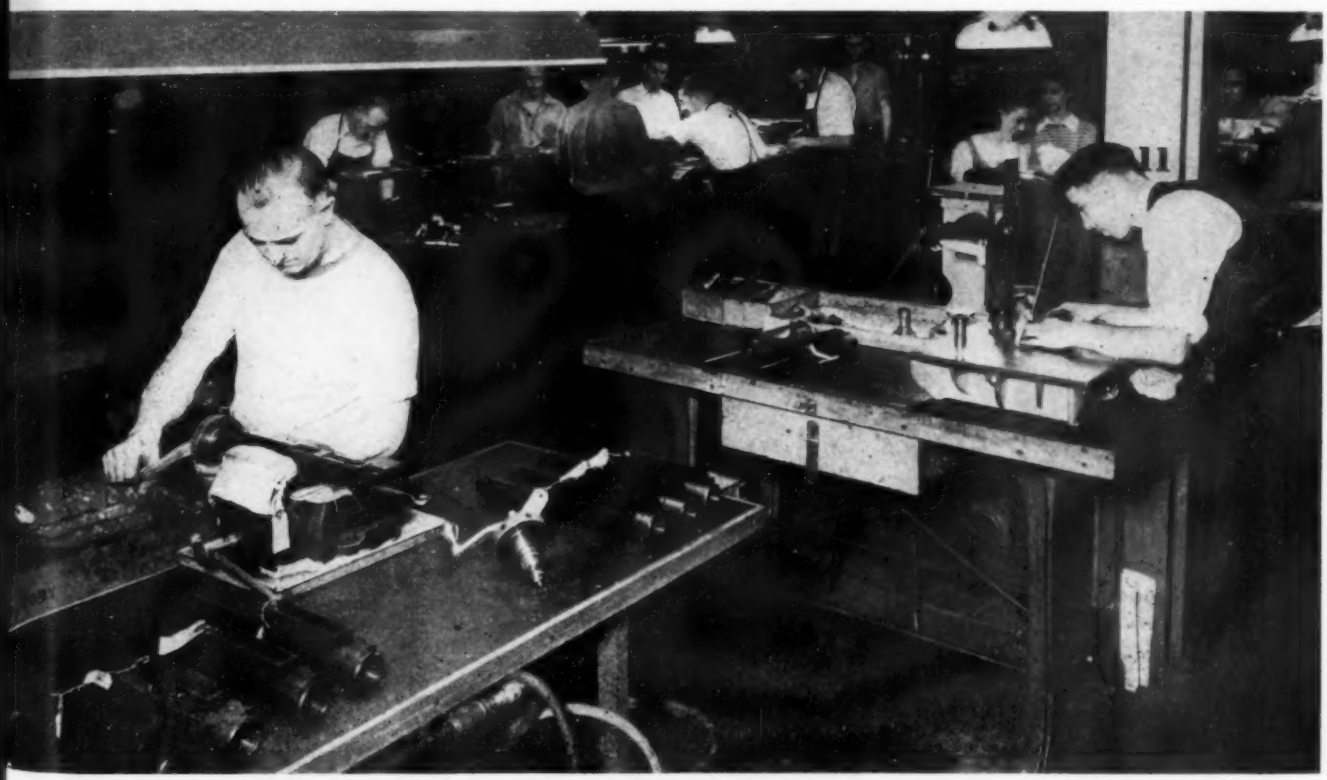


Resist grooves are rotary milled in cam sections on the end of each Boys breech bolt. These grooves must be accurate both as to dimension and location in order that they will mate perfectly with similar grooves inside the gun body. Key dimensions are taken from the bottom of the 0.600 in. diameter hole

Modern rotary milling machines play an important part in the machining of resist cams and grooves on breech bolts for the Boys anti-tank rifle. The cycle of each machine is automatic. The cam on the work spindle is held against a roller carried on the bed of the machine, pressure being applied by an air cylinder operating against the work slide. An arbor fitted in the work feed locates the work in relation to the bottom of the longitudinal hole previously drilled in the piece

bearing live center in the headstock of the grinder and the dead center in the tailstock are reground daily to insure accuracy. No lubricant is used on these centers as the thickness of the lubricated film would affect the accuracy of location of the work piece in relation to the dial indicator used for accurately setting the work in relation to the wheel. For setting the wheel, a 0.001 in. indicator is brought against stops on the table of the machine. The wheel is dressed every five to six pieces, as no more than 0.001 in. radius is permitted at the bottom of each groove.

Resist grooves are machined in the body forging for the Boys anti-tank gun to mate with the resist grooves on the end of the breech bolts when the two are selectively assembled. After all machining operations have been completed, on the bodies, and the parts have been heat-treated, they go to a final finish bench where the resist grooves are reamed by hand with a special tool which locates the groove reaming cutters accurately from the end of the body. This tool is made up by assembling on the arbor of the reamer a number of individual cutters ground to the shape of the grooves. Extreme care is required when performing this operation.



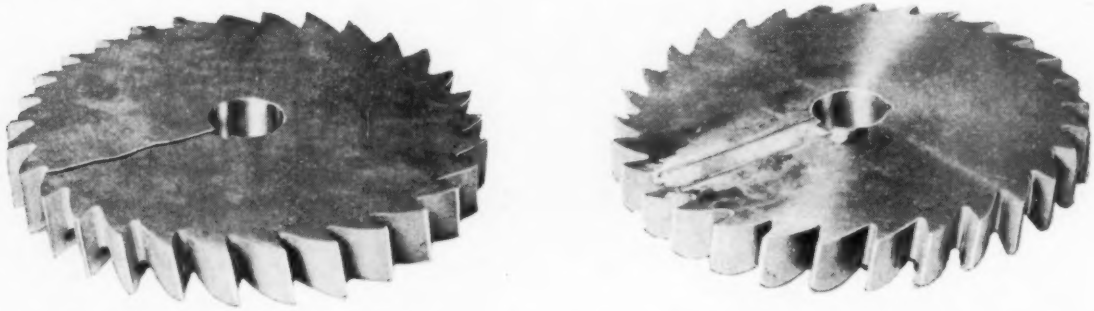
Because the resist grooves on the breech bolt must mate perfectly with resist grooves in the body of the Boys gun, the final operation on the body forging consists of hand reaming the grooves in that piece. A sectional reamer has been developed for this operation in order that damaged cutters can be replaced economically

Brazing Averts Tool Shortages

DESPITE considerable effort to train new war-plant workers in the proper handling and use of tools, breakage remains a critical matter because of expanding employment. Jobber airplane drills are particularly short, but larger drills, reamers and milling cutters are broken too frequently for one reason or another. An organized salvage program is therefore an important function of supervisory personnel responsible for perishable tools.

Breakage in tool categories varies with the plant, but it is often possible to establish standardized salvage procedures for those items which are most frequently broken. This practice is followed so far as possible at Linden.

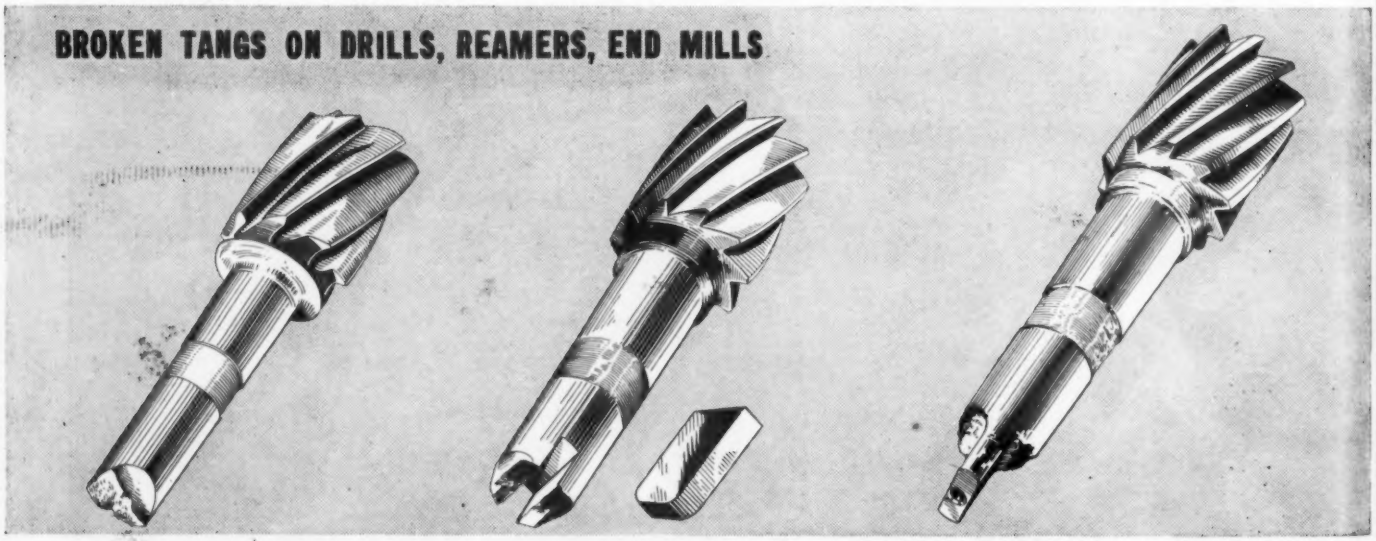
STRADDLE MILLS



DAMAGE—Cracked from the keyway.

REPAIR METHOD—(1) surface grind a slot $\frac{1}{2}$ in. wide by $\frac{3}{16}$ in. deep, (2) fit a strip of low-carbon steel to slot, (3) clean and flux, (4) place cutter on wet asbestos, (5) braze with silver solder, and (6) clean up back of cutter and sharpen.

BROKEN TANGS ON DRILLS, REAMERS, END MILLS

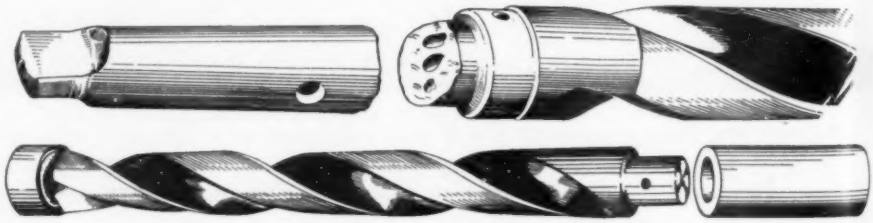


DAMAGE—Tangs twisted off.

REPAIR METHOD—At one time tangs were replaced by building up metal by welding and machining. The new method illustrated gives a stronger tang and is a simpler operation. Procedure is: (1) mill slot in taper shank the same width as the tang, (2) cut tang piece from low-carbon stock, (3) clean and flux the parts, (4) braze the assembly with silver solder or brass welding rod, and (5) dress to original form and center so that the tang will be driven properly.

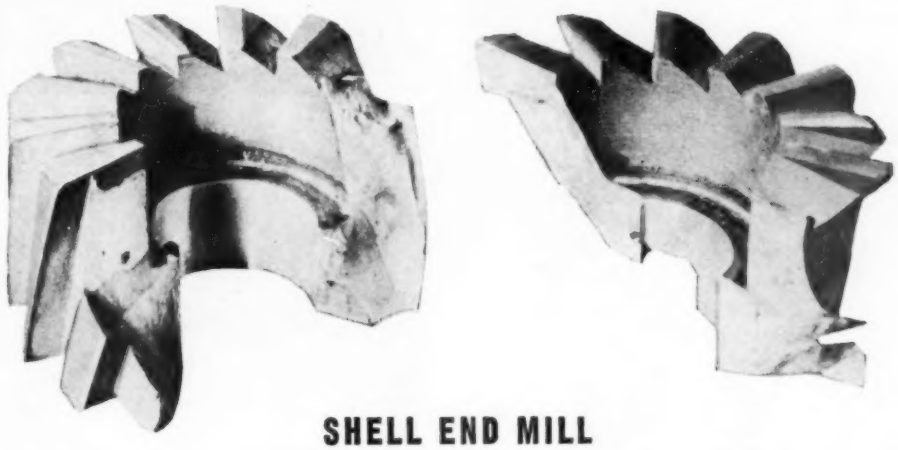
DRILL ADAPTATION

ORIGINAL TOOL—$1\frac{1}{4}$ in. diameter by $13\frac{1}{2}$ in. long special oil-hole drill for axle member, broken in the taper shank. Required tool—oil-hole drill with a $1\frac{1}{4}$ in. straight shank for use on a turret lathe.



BY R. C. HOLLOWAY, PERISHABLE TOOL SUPERINTENDENT, LINDEN PLANT, EASTERN AIRCRAFT DIVISION OF GENERAL MOTORS

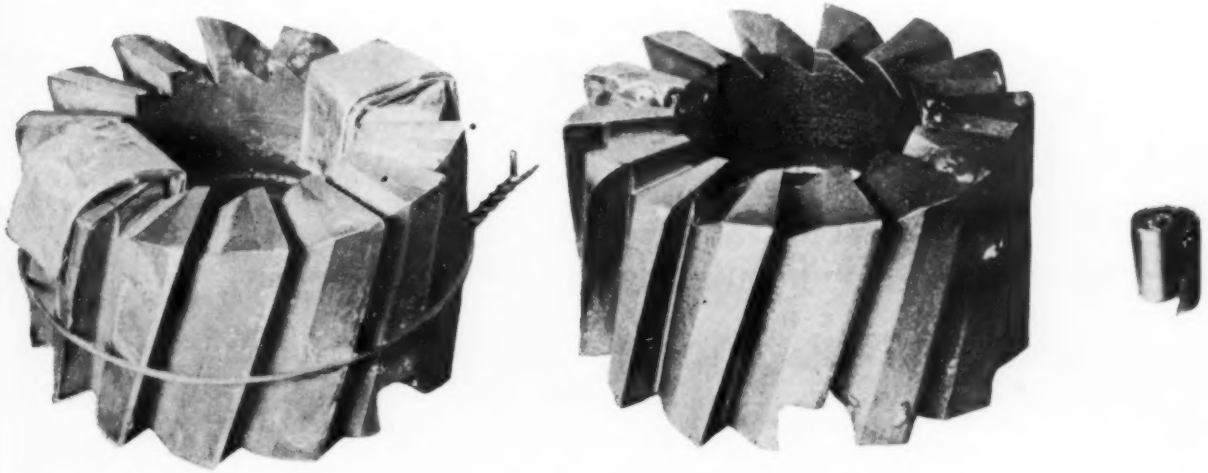
The prerequisites to satisfactory repairs are: first, thorough cleaning of the broken parts (and any new sections) with carbon tetrachloride, used with a brush, to remove all traces of grease and dirt; second, application of a good flux, and third, selection of a brazing method suited to the extent of the break and the severity of service the repaired tool will encounter. Low-temperature brazing, using silver solder or brass rod applied with a gas torch, is satisfactory for the bulk of small tools, and the localized heat can be "walled off" from the cutting edges with wet asbestos. Larger tools broken right through, especially cutters, are best copper brazed in a high temperature furnace. Since with this treatment the tool must be rehardened anyway, copper brazing can be done as part of the hardening cycle. Specific salvage procedures for more commonly broken tools are given in sequential detail below and upon the next page.

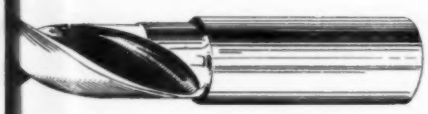


SHELL END MILL

DAMAGE—Broken cutter body.

REPAIR METHOD—(1) clean and apply very thin coat of flux, (2) mate broken parts, tightly bind with wire or apply C-clamp to obtain as tight a joint as possible, (3) spot weld cutter assembly at four points to hold pieces together while heating and brazing, (4) place sheet copper over breaks as shown, (5) place cutter in furnace, preheat to 1200 F., then harden in regular manner, which also effects copper brazing of assembly, (6) draw the tool, sandblast and grind. The closer the arbor hole is held to size, the better the brazing job. If hole is slightly large, chrome plate and grind.





SALVAGE METHOD—(1) grind drill shank straight for approximately 1 in., (2) make low-carbon steel shank with one end a slip fit on the drill shank and 0.020 stock allowance on the O. D. for grinding, (3) Cross drill ¼ in. hole in drill body, and drill and tap oil connection in low-carbon shank. (4) clean and flux parts, (5) torch braze with silver solder. (6) solder tip on drill point, (7) center and grind new shank to size between centers, (8) remove tip from drill point and regrind the latter.

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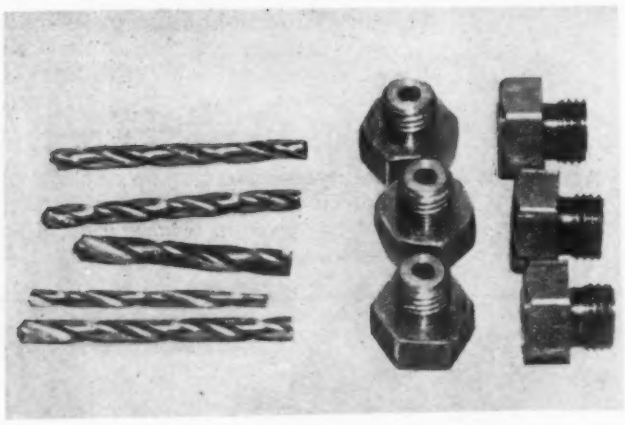
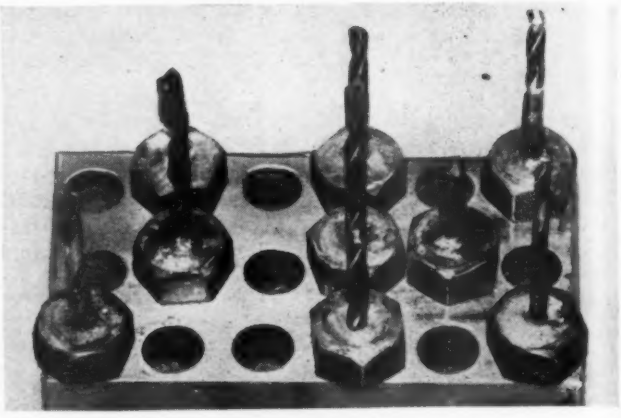
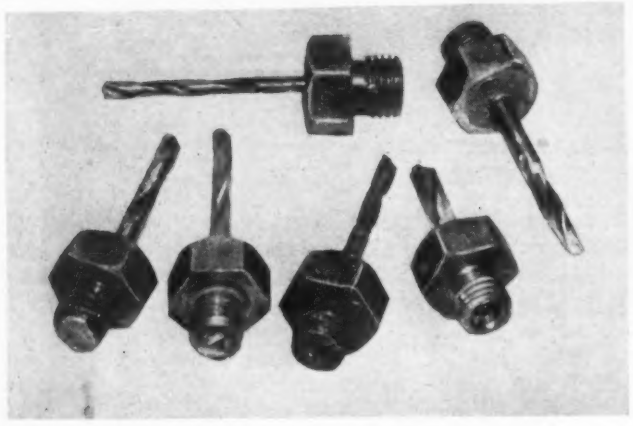
BRAZING AVERTS TOOL SHORTAGES (CONTINUED)





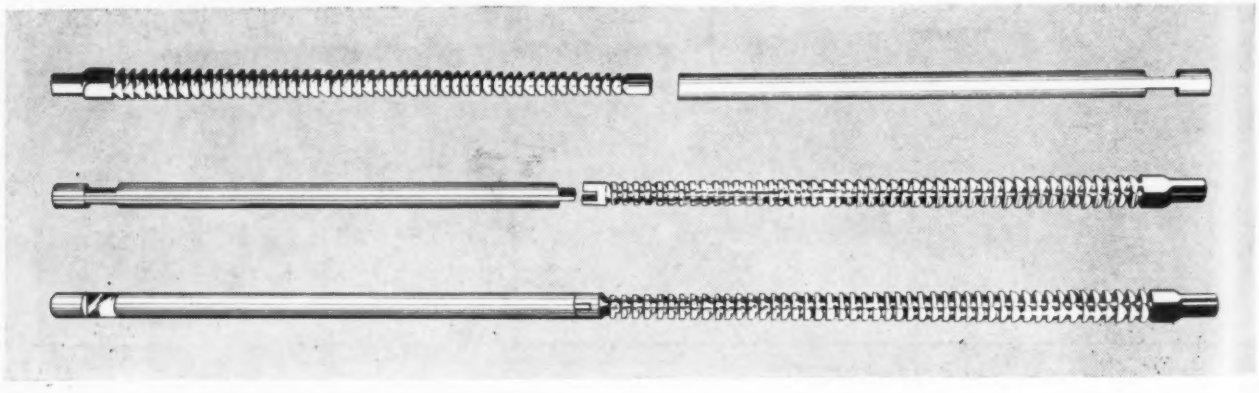


DRILLS FOR TERRY ADAPTERS

DAMAGE—Broken in fluted portion.

REPAIR METHOD—(1) make threaded hex adapters on automatics for Nos. 10, 11, 20, 21, 30 and 40 drills, (2) broken drill and adapter are cleaned and fluxed, (3) drill is soldered in place, (4) drill is ground. Thousands of these drills are used in wing fabrication. Since the supply situation is critical, this repair method makes use of short and broken drills otherwise unusable. A Terry adapter using balls that grip in the flutes promises to eliminate the above procedure.

BROACH ADAPTATION



ORIGINAL TOOL—Square push broach obsoleted by an engineering change. Tool converted to a pull broach.

SALVAGE METHOD—(1) make shank from drill rod, (2) grind groove in end of tool in proper relationship to square of the broach, (3) clean, (4) place drill-rod shank in lathe collet with approximately 2 in. of the tongue end protruding, (5) fit grooved end of broach onto tongue end of shank and put other end of broach on tailstock center, (6) flux, (7) braze with silver solder containing 5 percent nickel while broach is slowly rotating. Wrap broach with wet asbestos to prevent overheating the cutting edges.

METAL CLEANING SOLUTIONS

What they are, how to use them and why

Number 2 in our series of articles on metal cleaning discusses the four chief classes of materials used. Each of these is treated from the point of view of its adaptability to various methods, machines and dirts. A third article will appear in an early number.

BY DR. R. W. MITCHELL AND MARCEL T. ZINTY, MAGNUS CHEMICAL COMPANY

WHILE THERE ARE a great many different kinds of metal-cleaning materials on the market, they can be grouped into four major classifications. The oldest class is the alkaline cleaners—still most widely used for many cleaning operations. Petroleum spirits are used for certain kinds of cleaning operations, as is the method utilizing certain chlorinated solvents. Finally there is the newest development, the emulsifying or emulsiafiable cleaner, which has many advantages over the other materials. These four classes of cleaning materials are discussed in turn below, with due consideration given to their outstanding advantages and disadvantages as well as their abilities to meet the requirements of the factors covered in the preceding article.*

* Acid cleaners are coming into extensive use, particularly for cleaning before painting, but they are to be regarded as adjuncts to a cleaning operation, since they must be used *after* a previous cleaning process using one of the four major types of cleaners.

ALKALINE CLEANERS

The major advantage of this type of cleaner is the ability of alkaline solutions to emulsify most greases and oils. This and their low cost are the chief reasons they are so extensively used. An important advantage is that alkaline cleaner solutions can be sprayed at high pressure, so that the mechanical action of the pressure spray is added to the chemical action of the cleaning material in removing solid particles of dirt.

Modern alkaline cleaners are not based on caustics, even where the extent and nature of the deposit calls for the high alkalinity of a heavy-duty cleaner. Such jobs are now handled by properly selected alkaline salts which give the required alkalinity with less harmful effect and less danger. However, in heavy-duty cleaners, handling precautions *are* necessary, for while the chances of burns and skin injuries are not as great as in the case of caustics, the degree of alkalinity used does create a danger.

In selecting alkaline salts for these cleaners, it is possible to provide what is known as "buffer action." That is, salts can be used which not only provide solutions with the required degree of alkalinity, but which also yield additional alkalinity as the action of the cleaner uses up the original supply. Properly buffered solutions will maintain a constant alkaline level in the cleaning solution.

The addition of suitable wetting agents to an alkaline cleaner will not only speed the wetting of deposits but will insure much speedier penetration of the dirt. Above all, added wetting ability contributes to the rinsability of the cleaning solution, which is a vitally important factor in all metal cleaning operations, since, in addition to the dirt, all traces of cleaning material must be removed. A cleaner with poor rinsing properties inevitably leads to poor cleaning results.

NATURE OF ALKALINE CLEANERS. There are a great many types of alkaline cleaners, from compounds which are practically all caustic soda (or for that matter, caustic soda itself, which is still in considerable use despite its many disadvantages) and running the gamut of a wide variety of salts and compounds of all degrees of alkalinity.

For effective attack on greases and fats and for satisfactory action on mineral oils, additional wetting action is needed. Hence most alkaline cleaners contain soaps of various types as well as synthetic wetting agents. The soap must be in a colloidal condition if it is to have any value as a cleaning and emulsifying agent. Yet at the pH usually required for metal cleaning (from a minimum of 11.00 to a maximum of 13.00) ordinary soaps cannot maintain this colloidal condition. Hence special soaps are essential. Even heavy-duty alkaline cleaners, used for the removal of quenching and slushing oils, require addatives to insure effective and economical cleaning.

MAJOR USES. In general, we cannot say: "This is a clean cut case where alkaline cleaners should be used," or

"Here we must use a degreaser." The nature and condition of the work, the degree and adherence of dirt, the degree of cleaning required, the set-up of the plant flow sheet, and the nature of existing cleaning equipment are major determining factors. It is safe to assume, however, that if a metal has to be chemically clean, an alkaline cleaner must be used in the final cleaning operation. Either the solvent or emulsifiable cleaner method may be used to preclean the metal, but the chemically clean surface required for quality plating depends finally on a properly selected alkaline cleaner.

Alkaline cleaners can be used on practically every metal cleaning problem. For example, large intricate hollow objects are most satisfactorily handled by the alkaline cleaner method because the spray system can be designed so that dirt in any location and in any amount can be removed.

DISADVANTAGES. Tarnishing, spangling, etching and other forms of excessive alkaline corrosion on aluminum, tin, brass, zinc and other metals attacked by alkalies makes the use of alkaline cleaners undesirable for these metals. There are alkaline cleaners which can be used safely on aluminum and its alloys, but they must be used under careful control. There are other types of cleaners available which have no harmful effect on alkaline-attackable metals under any circumstances. Where end results permit, cleaners of this type should be used.

IMPORTANCE OF TESTS. In view of the many factors which govern the selection of an effective and economical alkaline cleaner—particularly when vulnerable metals and difficult dirts are involved—the only safe way to reach a decision is to carry out suitable tests on the work to be cleaned, under conditions which are as close to those to be met in the final cleaning operation as possible, and using the various types of cleaners available for the cleaning job. If one or two reputable manufacturers of metal-cleaning compounds work out recommendations on the job, a clean-cut and dependable answer should be obtained in a relatively short time.

As a rule such a procedure is necessary only with alkaline cleaners. Solvent and emulsifiable cleaners are relatively limited in their variety and the question of their adaptability to a particular cleaning operation is much more easily answered.

SOLVENT CLEANERS

The use of certain chlorinated solvents for metal cleaning was extensively developed in Europe before the method was first introduced into this country about 1925. Since that time this method of cleaning, usually called degreasing, has been continually improved and is well established as an effective solution to many metal cleaning problems.

In a vapor degreaser the cold metal object is suspended in the hot vapor above the boiling solvent. The lower temperature of the work causes the vapor to condense on it, forming a clean liquid solvent which dissolves those oils and greases which are soluble in the solvent and removes them as it runs off the work and drips back to the tank below. However, the flow rate of the condensed solvent over the work is not fast enough to flush off all solid particle dirt, lime, pigments, lint, metal particles and other insoluble dirts. Though complete degreasing of a metal surface can be obtained by the use of the proper solvent, a chemically clean surface will not be produced. Nor can physically clean surfaces be obtained from the simple vapor treatment without subsequent wiping operations.

The results obtained from the vapor degreasing phase can be improved by preceding this treatment with a spray or soak of the solvent, or by swashing the work in a solvent bath. The mechanical action of the agitated solvent tends to remove more of the solid particle dirt than the vapor phase alone. The usual cycle for very dirty parts in modern degreasing machines is:

1. Initial soak in tank of solvent
2. Second soak in another bath of solvent
3. Spray with solvent
4. Cooling the work (often in refrigerated zone)
5. Vapor cleaning phase

Nevertheless, this combination treatment does not provide a chemically clean surface. Alkaline cleaning, either in a washing machine, still tank, or electrocleaning tank, is still necessary whenever such cleaning is required.

MAJOR USES. Vapor degreasing is especially useful where the removal of greases or oils is the cleaning problem. It is well adapted to the cleaning of small metal objects with rolled edges, seams and pockets from which it is difficult to rinse, drain or dry water solutions. It is an effective means of removing many lubricating or antirusting materials. The solvent cleaning method is also ideal for cleaning nonferrous metal articles where water staining must be avoided.

DISADVANTAGES. The solvent cleaning method, as has been pointed out, will not remove solid particle dirt in many cases, and it cannot provide a chemically clean surface for electroplating and other finishing operations. It is not adaptable to cleaning large objects. Because oil and grease are completely removed, steel and iron parts cleaned by this method tend to rust rapidly unless promptly protected by an antirust coating, painting or lacquering.

A catalytic action frequently takes place where solvents vaporizing below the boiling point of water are used with aluminum articles bearing a large amount of finely divided aluminum particles. In the presence of water vapor this finely divided aluminum breaks down the solvent, forming hydrochloric acid which corrodes the tank and other parts of the machine. Where a solvent is used which vaporizes at a temperature above the boiling point of water, there is no possibility of water vapor being present in the cleaning areas and this difficulty is avoided.

Because of the relatively high cost of the solvents used, solvent cleaning is more expensive than all other methods. The commonly used degreasing solvents also involve considerable vapor loss during the cleaning operation. This waste can be reduced greatly by the use of properly designed closed machines, but it must be considered as a factor in all relatively low boiling solvents. Where the solvent boils at such a high temperature that it will condense readily without need for cooling water, vapor losses are negligible. This is particularly true where the vapor itself is relatively heavy, which is usually the case with such high boiling materials.

Considerable cooling water is required for degreasing operations with ordinary solvents. High boiling solvents, however, do not need cooling water. Since the machine then needs no water connection, it can be made more portable. Because heavier solvents are more practical for spraying, more effective treatment prior to the vapor phase is possible.

PETROLEUM SPIRIT CLEANERS

The use of petroleum solvents is different from ordinary metal cleaning in that its purpose is primarily the removal of incidental processing dirts. It is not used to prepare a surface for plating or other finishing operations requiring a chemically clean surface. It does not even give a physically clean surface for ordinary finishing operations. But it is, nonetheless, a vitally important cleaning operation.

Essentially, petroleum spirit cleaning, using "safety solvent," sold under a variety of trade names by the major petroleum product distributors, is a washing off of lightly adherent shop dirt, dust and similar undesirable materials prior to or after assembly. This type of solvent will remove many light deposits of oil, grease and protective coatings.

The actual washing operation is simple. Parts, assemblies and other objects to be cleaned are either dipped or sprayed with the petroleum spirits and after draining, are dried off with compressed or blower air. The method is adequate under the following qualifications, but for ordinary cleaning operations one of the other methods should be used.

There are many delicate mechanisms or intricate assemblies subject to rusting or water staining which could be cleaned in no other way. Alkaline cleaners could not be used because of their possible tarnishing or etching action and the necessity for rinsing with water. Emulsifiable cleaners, where a water pressure rinse is required, are also ruled out. Solvent cleaners are barred because such articles or assemblies must not be degreased completely in order to avoid rusting and other action.

DISADVANTAGES. Petroleum spirit solvents are volatile, with flash points low enough to constitute a definite hazard. Hence they must be used with caution. In fact, though they have been widely used in dipping tanks, they should not be used except in equipment designed specifically for their use, on which adequate protective devices are properly installed. For example, any device for using these spirits should be adequately grounded to avoid static sparks. Automatic closing tank covers with fusible controls and explosion-proof motors and wiring must be provided. There should be suitable provision for ventilation, using well-designed dampers and safety doors. And finally, automatic functioning quenching apparatus which will go into action instantly must be installed. Carbon dioxide flasks hooked up with a device which spreads a blanket of quenching vapor immediately upon the outbreak of a fire is one of the best ways of solving this problem.

EMULSIFIABLE CLEANERS

The new emulsifiable cleaner method has the advantage of low overall cost, plus freedom from any danger of attack on any metal. It is based on an oil-soluble penetrating and dispersing solvent which is mixed with kerosene or safety solvent in the proportions of one part concentrate to ten parts kerosene.

This solution is sprayed on the work to be cleaned, or the work is dipped into it. The time of contact is short—usually about 30 seconds. After an equally brief drainage period, the work is rinsed free of dirt and cleaning solution by a cold water spray. The solution forms an emulsion and suspended dirt is flushed completely away by the rinsing, leaving the surface clean except for a trace of solvent. This has no harmful effect on such finishing operations as painting or lacquering.

Surfaces are washed physically clean. This gives better results for most finishing purposes than those obtained from solvent cleaning operations because solid particle dirt is completely removed without the need for wiping or subsequent cleaning operations. Emulsifiable cleaners are excellent for use before bonderizing as they do not passivate the surface. Where a chemically clean surface must be obtained, a following alkaline cleaning is necessary.

MAJOR USES. The emulsifiable cleaner method may be regarded as an alternate to the solvent cleaner in precleaning operations and as a major method in the removal of dirts which do not readily respond to alkaline cleaning. It is more effective than solvent cleaning in removing solid particle dirts. In many ways the emulsifiable cleaner method offers a combination of the desirable features of solvent and alkaline cleaning. It has no harmful effect on any metals and is applicable to a wide range of cleaning problems. It is used in cold or only slightly warmed solutions so does not require any appreciable amount of heat, except where hot water is used in a final rinse to insure rapid self-drying.

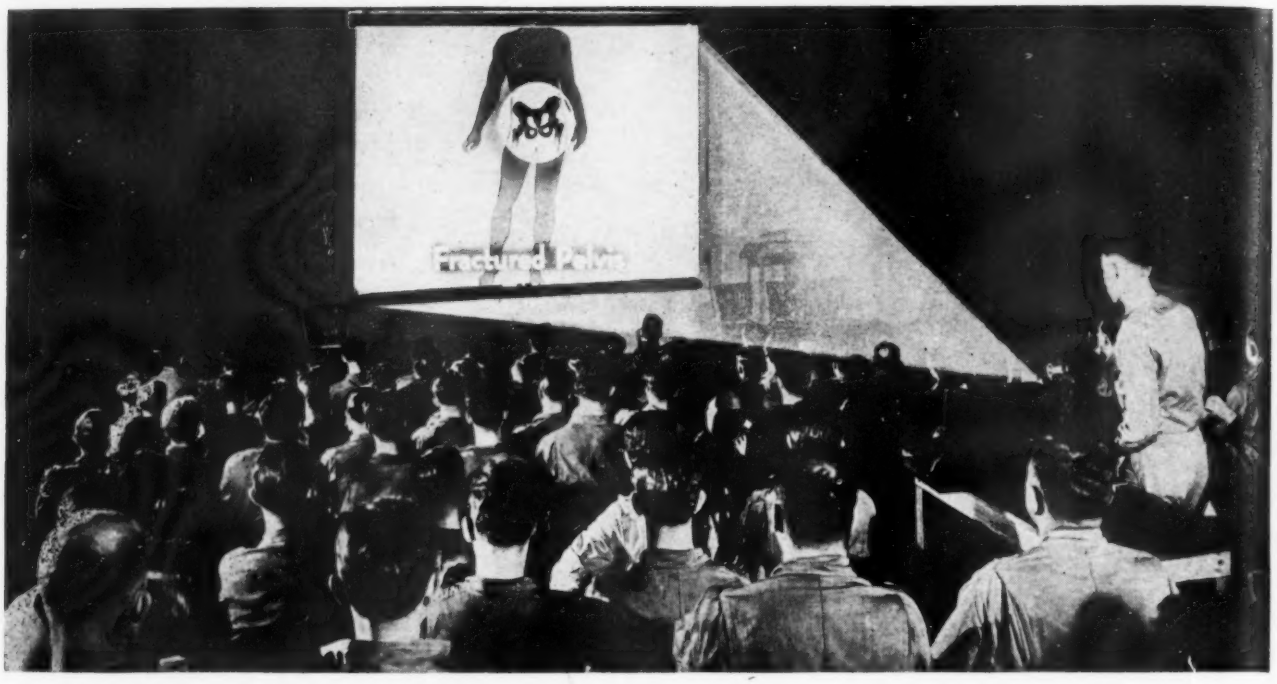
The emulsifiable solvent method of cleaning is particularly successful in removing many dirts which are not touched by other methods of cleaning, such as smut on steel. Hence, when unusually recalcitrant dirts are met with, it is often necessary to preclean with an emulsifiable solvent. Many polishing and buffing compounds, slushing oils, drawing and stamping compounds and lubricants require emulsifiable solvent cleaning to avoid hand wiping or brushing operations.

CLEANING LARGE UNITS. The emulsifiable cleaner method is the quickest, cheapest and most effective cleaning method for many large units too large for cleaning in a machine or for immersion in a tank. It is also useful for cleaning large machines and assemblies after being in service, prior to repairs, adjustments, maintenance or repainting, and is applicable to such varied jobs as tractors, road and mining machinery, tank chassis and parts, gun mounts, etc.

The work is brought to a wash station where the floor has sufficient pitch to allow for draining and disposing of hose water. This station usually just precedes the repair or paint shop and is often simply screened off from the rest of a room with canvas to confine splashing and spray.

Cleaning is readily accomplished by spraying the article manually with emulsifiable cleaner solution from a compressed air sprayer, allowing the solution to soak in for about fifteen minutes. It is then given a cold water spraying with a pressure hose. This gives a well cleaned surface, ready for maintenance work or for painting, with no further treatment beyond the use of a compressed air blast to remove the last traces of moisture.

DISADVANTAGES. This method of cleaning should not be used on objects which tend to nest together to form pockets from which the solution will not readily drain or which cannot be directly acted upon by the rinse sprays, unless suitable mechanical means are provided in the washing machine to insure good drainage and adequate spray action. In many cases, suitable washing machine design will suffice.



Slidefilms Teach First Aid

BY LYNE S. METCALFE

Workers versed in first aid are safety conscious and their quick action following an accident will often minimize its results. The use of filmstrips provides a fast means of teaching this subject

CONSERVATION of available man and woman power now being a major objective of all industry, more and more stress is being laid upon those factors which tend to make this conservation possible. Aside from effectual accident prevention, attention is being paid to workers' diets and health habits. And in this program, industry has come to recognize the true relationship between first-aid education and safety.

In spite of stepped-up efforts to safeguard the physical well-being of workers, accidents will happen. The penalty of any plant accident depends to a large extent upon what is done after the accident has happened, as well as on the nature and seriousness of the accident itself.

Some means was sought by both government and industry early in the war production program to speed the teaching of first-aid fundamentals. Since, plant doctors and nurses are hard pressed these days, recourse has been made to the picture screen by many large companies in the metal-working field to achieve that result.

Recently a series of 19 slidefilms was produced with the cooperation of the Bureau of Surgery and Medicine of the Bureau of Aeronautics of the United States Navy which provides a supplementary course in approved first-aid procedures, and which has now been made available to industry. With each filmstrip, two of which have been produced in Technicolor, there is a disk record carrying a synchronized lecture, and with each film-record unit is a correlated printed textbook. The series also includes a teacher's manual.

It should be pointed out that it is not the purpose of this series of slidefilms to substitute for any of the tried and tested methods of teaching first aid. It merely provides a speed-up for plant doctor, nurse or first-aid instructor in giving the uninitiated a quick over-all pattern of emergency procedures covering all accidents common to every day life and particularly to the industrial plant. This leaves more time for the instructor to elaborate, demonstrate and supervise actual first-aid practice, using live models.

The 19 filmstrips comprise a total of over 1,000 special photographs, drawings, charts, diagrams and exhibits. The series of films and records has been arranged so flexibly that any user may vary the application of the various units of sound, reading and picturization to suit its particular needs, either by integrating them with a first-aid instruction program already established, or by using them as a basis for building a new program.

One Company's Experience

Perhaps the Marine Division of The Bendix Aviation Corporation, at the Brooklyn, N. Y., plant where 2,500 machinists are employed, has had more experience in the use of the slidefilm series than almost any other company in the field. This company holds a first-aid session once a week, with a limit of 25 employees at each session. Each filmed subject is the basis for one lesson which usually is an hour or more

in length. In some instances, largely depending upon the subject and immediate conditions, the students are given the printed textbooks to study first, followed by a visualization (without the record) of the same subject in the class that follows. The instructor then elaborates on the pictured material and pauses at intervals to make practical demonstrations and trials using a live model in a bathing suit. In other instances, only the recorded lecture is presented. This is followed by questions and answers, and general class discussion. Usually, the procedure is as follows:

1. Introduction of the subject by the instructor.

2. Projection of the film with its recorded complementary lecture. There are pauses for physical demonstrations, trials by students, and detailed elaboration by the instructor.

3. Summation of the subject by the instructor, followed by questions and answers.

4. General discussion by the class.

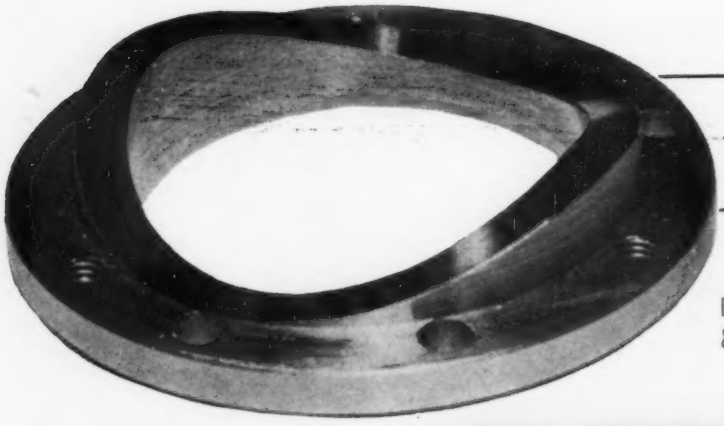
The flexibility of this visualized course is one of its most valuable features to the certified first-aid teacher. It places in his or her hands a valuable tool which greatly eases the burden of the job and goes far to speed up and intensify training. Of course, experience has shown in the past that screened pictures can more quickly achieve a uniform understanding of principles which otherwise the teacher would be compelled to convey in words, or which would have to be absorbed in tedious book study.

In addition to providing first-aid training, this supplementary visual system is effective in motivating safety practices. It can be used to give vivid safety lessons long remembered by workers. The pictures provide means for the safety director to show the "working parts" and the "care and repair" of the human body. Every one in the class can see why helmets, goggles, safety shoes and other protective devices help individuals to avoid pain, suffering, and loss of productive time. They will want to think safety at all times. It is considered by safety engineers using this system that first aid is an adjunct to safety education mainly in that it tends to bring home to the average worker the actual results of an accident.

A brief description of the 19 slidefilm subjects is given in the table.

SUBJECTS OF AVAILABLE SLIDEFILMS

Film No.	*No. of pictures*	*Subject*	*Remarks*
1	55	Purpose of first aid	A preview of the course and some of its applications.
2	45	The human body — I	Muscles, tendons, skin, blood, skeleton, head, trunk, upper and lower limbs.
3	54	The human body — II	Heart, arteries, capillaries, veins, breathing, nutrition, nervous system.
4	31	Shock	How to recognize and treat shock victims.
5	62	Unconsciousness	Unconsciousness due to such things as heat stroke, heat exhaustion, apoplexy, fainting.
6	56	Common emergencies	Appendicitis, choking, diarrhea, earache, toothache, common colds, sunburn, poison ivy, poison oak, insect bites, fainting.
7	62	Minor injuries	Sprains, strains, dislocations, bruises, frostbite, foreign bodies in the eye, ear, nose and stomach.
8	49	Wounds — I	How to stop bleeding and prevent infection.
9	57	Wounds — II	Abrasions, cleancut wounds, jagged or torn wounds, deep wounds, animal and and snake bites.
10	75	Dressings and bandages — I	Materials used in bandaging wounds. How to apply bandages.
11	77	Dressings and bandages — II	Commonly used bandages.
12	32	Artificial respiration	How to apply artificial respiration by the prone pressure method.
13	39	Burns	First-aid treatment for burns and scalds.
14	39	Poison	Treatment of drug, food and carbon-monoxide poisoning.
15	59	Fractures — Types	Two principal types of fractures, general first aid treatment, specific treatment for fractures of leg, forearm, upper arm, elbow, finger and collar bone.
16	56	Fractures — Treatment	How to treat fractures of skull, jaw, nose, spine, ribs, pelvis, thigh, knee-cap feet and toes.
17	64	Fractures — Splints	Fixed traction splints.
18	47	Moving the injured — I	Various types of stretchers.
19	63	Moving the injured — II	How to improvise a stretcher and how to carry injured when a stretcher cannot be made quickly.



The finished cam

Cam Milling

BY D. E. CARPENTER, WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

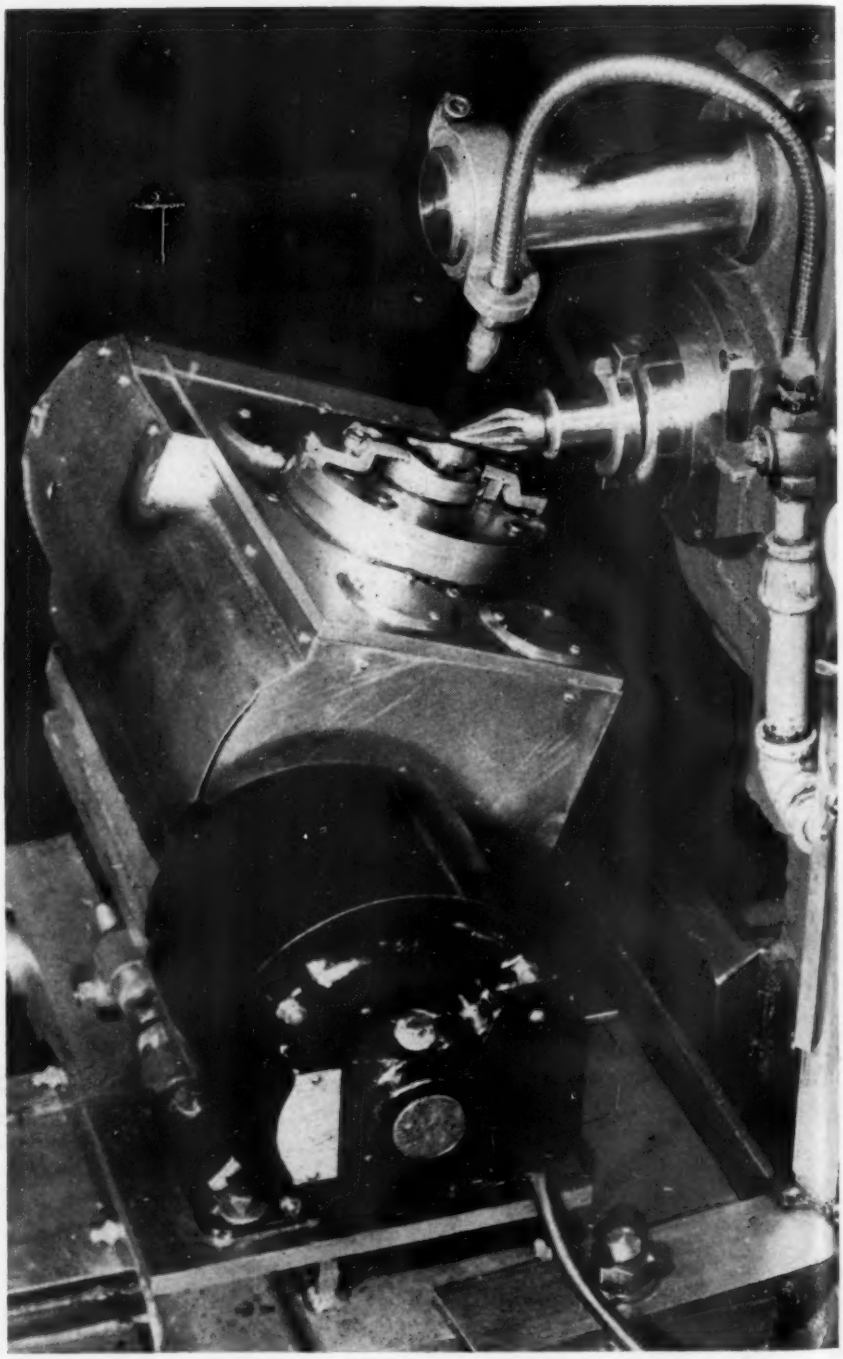
HAVING EXPERIENCED difficulty in purchasing face-type cams of a desired accuracy of shape and symmetry in quantities sufficient to fill production schedules, the Westinghouse Electric & Manufacturing Company has designed an ingenious motor-operated fixture to insure a wave form of the cam surface which is mathematically correct within a limit of 0.002 in. at all points. With this fixture several thousand cams of simple harmonic motion have been produced with less than 0.25 percent rejects, and with substantial cost saving. Moreover, where formerly 100 percent inspection was required, a 10 percent spot-check inspection is now satisfactory.

Previously, the cutting of the cam surface had been controlled by a master cam which rotated and oscillated the workpiece against a vertical cylindrical end mill. Cams made by this method reproduced all the errors of the master cam, as well as any dirt or chips which might accumulate on it. Other errors were caused by chatter, the riding of the roller, wear or regrinding of the cutter, and the lack of perpendicularity between the surface and axis of the cam.

Difficulties Overcome

To overcome these difficulties the cam blank was mounted on a rotation platform and cut in a horizontal mill by a conical cutter ground to the correct angle. To give the cam outline, the blank is raised and lowered by a pair of eccentrics mounted on the fixture shaft, while the blank spindle is rotated through bevel gears which connects it to the fixture shaft.

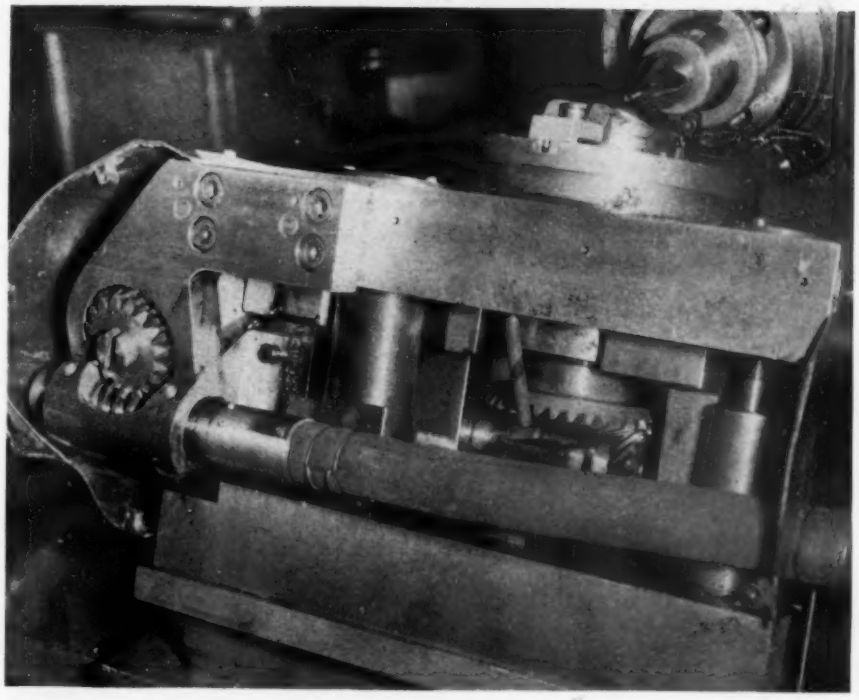
The milling cutter is made conical instead of cylindrical and the entire fixture is mounted on the milling machine table at a fixed angle. The conical



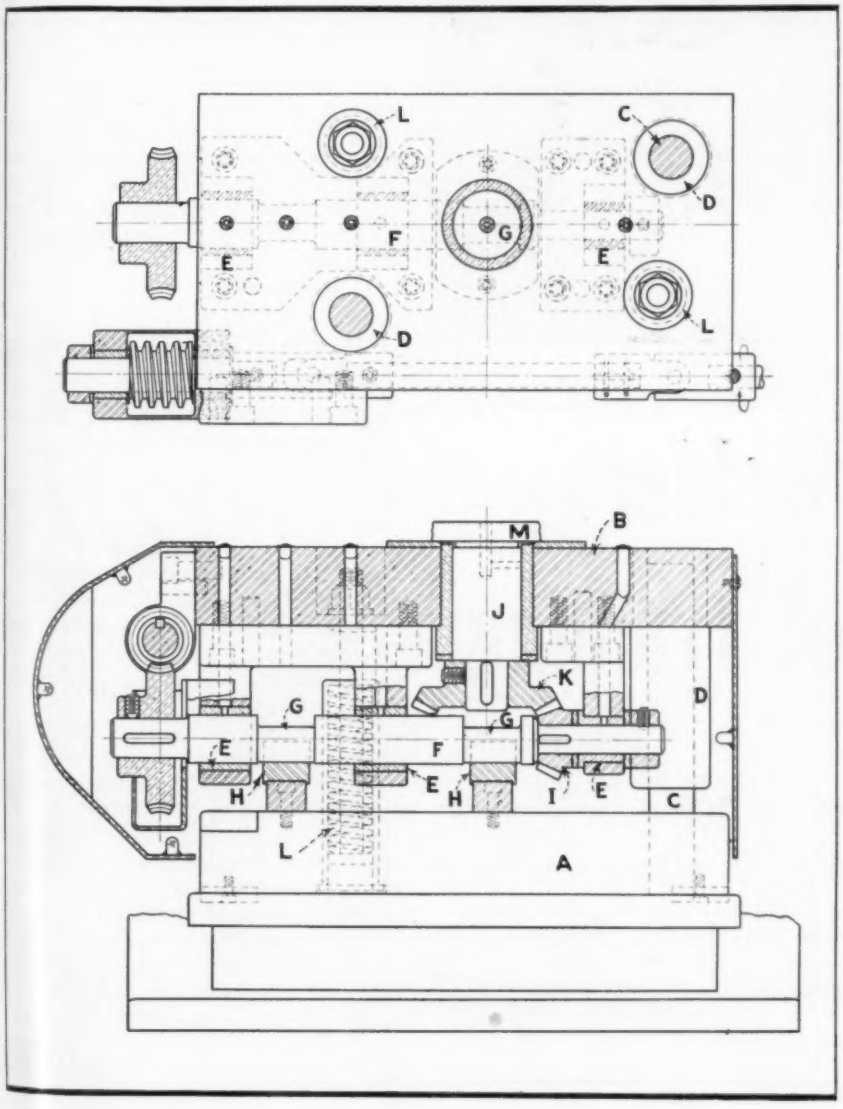
The angle of the cam surface is maintained by the positively mounted fixture and the carefully ground cutter

Made Sure

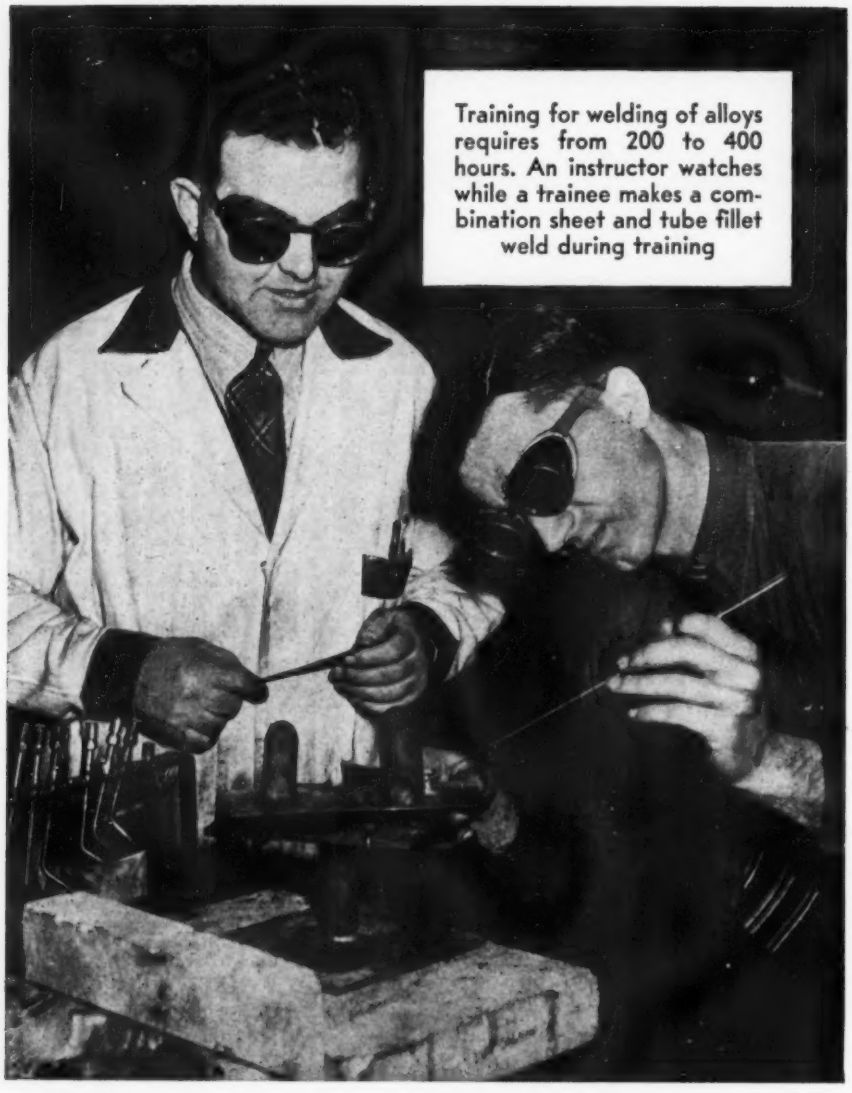
shape of the cutter permits the tool to have a large diameter shank and very rigid stubby cutting teeth which prevent tool vibration and chatter, and finish the surface so that all radial lines are substantially normal to the cam axis. The conical shape also permits the cutter to be reground frequently without changing the working diameter of the cutter and hence the shape of the cam surface. The incline of the work-holding surface of the fixture allows the flow of the cutting oil to wash the chips away from the work down the incline and keeps the mechanism clean.



Removal of the back cover reveals the bevel gears which turn the blank spindle and the flexible shaft which drives the fixture. The eccentrics which raise and lower the cam blank are concealed by the slides against which they work



A top view and front view, in section, of the fixture. The general scheme of the design is shown in the drawing. It consists of a base or bottom shoe *A* and top shoe *B* which is movable up and down on two long guide pins *C* and bushings *D*. Mounted on the top shoe are pedestal bearings *E* in which the shaft *F* rotates. This shaft has two eccentric sections *G*, which bear on two slides *H* mounted on the bottom shoe, and a bevel gear *I*. The shaft is rotated through a double worm reduction and flexible drive by a 1/4 hp. motor. The top shoe contains the vertical spindle *J* which has a fixture on the upper end *M* for holding the cam blank and a bevel gear *K* on the lower end which is driven by the bevel gear *I*. The upper and lower shoes are connected by two springs *L* which hold the upper shoe assembly down against the bearing slides *H* and supply the force for the downward movement



Training for welding of alloys requires from 200 to 400 hours. An instructor watches while a trainee makes a combination sheet and tube fillet weld during training

Aircraft Welders Need Special Training

Knowledge of automotive welding is not sufficient for working on aluminum and alloys. To create a corps of welders capable of passing the Navy tests, Eastern Aircraft Division set up an extensive training program

WELDING ALUMINUM and chrome-molybdenum steel requires a technique so far different from that of welding cold rolled steel that men experienced on the latter have to be given a complete course of training before they may work on the former. The difference in technique is caused by the more flighty nature of alloys: If too much heat is applied, the metal will be injured and the alloy will lose many of its special properties.

Eastern Aircraft Division of General Motors, engaged in the conversion of five General Motors plants to production of planes, found that it would not be possible to assign former automobile welders to do aircraft welding, for the two fields are different as night and day. More types of welds are involved and every part of the weld must have full penetration, in aircraft work. Expert coordination of the hands must be developed.

To devise a program for re-training automobile welders, a study was made at Grumman Aircraft Engineering Corporation and the services of the head of their school secured to set up and conduct a similar school at Eastern Aircraft.

A 50-pupil school was organized for training in chrome-molybdenum gas welding. At the same time, arrangements were completed to have the National Defense Training Program establish schools in Elizabeth and Jersey City, N. J., and to equip them the same as the plants.

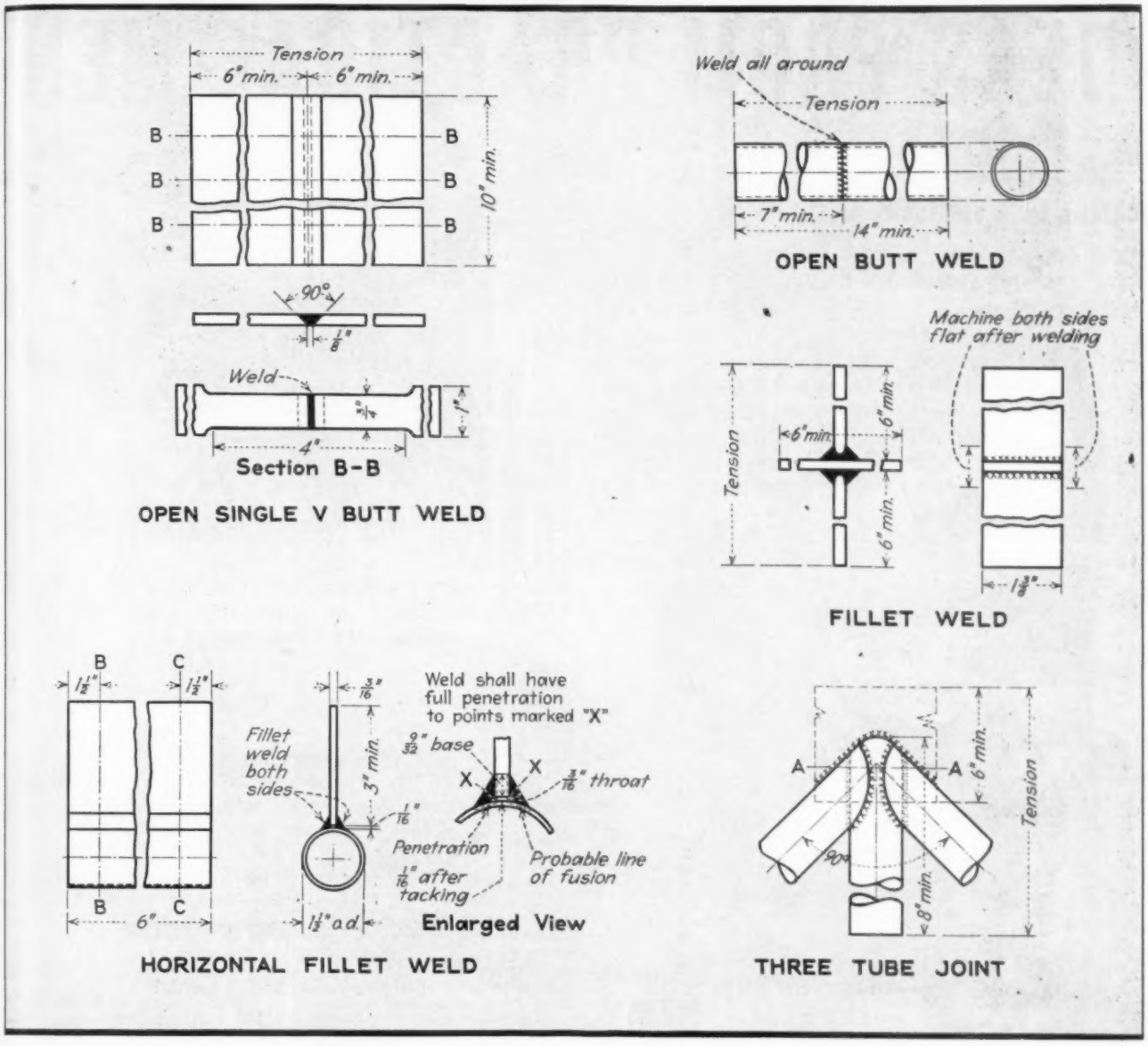
The course was arranged to take 320 hours, and to be given to the trainee on his own time. Pupils were secured through the U. S. Employment Service. Many General Motors men, then unemployed due to the process of conversion, enrolled in the course.

After completing the course given by the schools in Elizabeth and Jersey City, trainees transfer to Eastern Aircraft and are further schooled by 15 Drummond-trained, Navy-approved instructors. During this second stage of their training, they receive up to 400 hours of instruction under actual aircraft supervision before they take the Navy welding test.

The Eastern Aircraft Division's school has three parts:

The largest division gives training in gas welding to approximately fifty students. A lot of these men replace draft losses; aluminum welding is taught to twelve students at a time; aluminum-arc welding has six students.

The aluminum-arc welding classes are smaller because the process is quicker and requires less manpower to attain the same results. Eastern Aircraft Corporation is gradually shifting its work to arc welding, as the Navy



Before a trainee may receive his certificate and steel stamp with which to mark his work, satisfactory completion of certain tests are required. After he has made the illustrated welds to Navy specifications, his work is subjected to rigid tests to determine his proficiency. Welders are required to take check tests every six months

approves the change, step by step, part by part.

Before he can do welding, the pupil must take certain rigid Navy tests. Included in the test are open single V butt, tubular butt, vertical fillet, horizontal fillet and combination sheet and tube fillet welds. Each is tested, according to prescribed methods, to determine whether the weld has the required tensile strength.

Each graduate, having passed the required exams, receives a certificate of proficiency and a steel stamp with which he marks every piece he welds. Thereafter he must take a check test every six months.

If a welder becomes careless, he loses his certificate and stamp. Whether or not he gets them back depends on his attitude: if he has been sincere, he may get a non-stress welding job for a short time, or be sent back to school for "refresher" training, after either of which he may get a new test and regain his status.

To retain his skill, a welder must work each day. Every foreman of welders is required to weld one hour per day to keep his stamp and certificate. Lack of material, or shift to other work has resulted in welders losing their skill and then their stamp and certificate.

About 75 percent of the welders are women, and this is all to the good, for it has been found that women are generally better adapted to doing welding work than are men; they have the proper mental attitude and a steady hand. Expert coordination of the hands is important in doing welding, and women who sew or knit have an advantage over men, just as do artists and others whose background has embraced the use of the hands in deft operations. Though they generally take longer to train, some of their best welders are women, say officials of Eastern Aircraft's Linden plant. On the average, 25 percent more time is required to train the average woman than the average man. However, some women had gone through the training course in less time than the men.

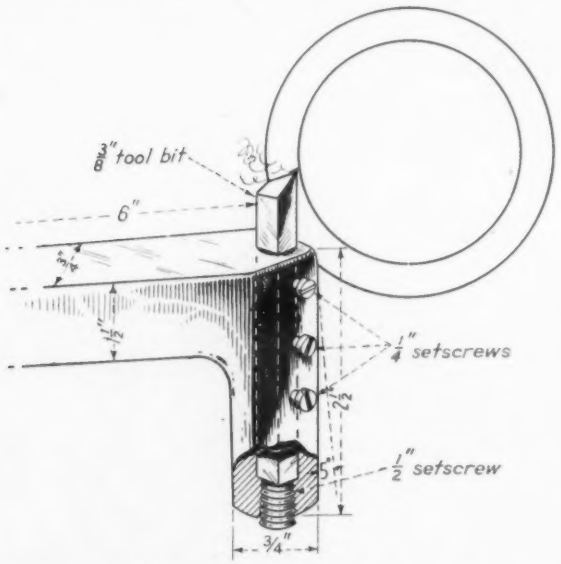
Usually training takes 400 hours, though some students do it in 200 hours.

IDEAS FROM PRACTICAL MEN

Toolbits Held Vertically to the Work

BY ROBERT S. BELL

The illustrated toolholder wherein the bit can be held vertically to the work has a number of advantages and can be used on a majority of turning jobs. Toolbits of very small lengths can be used, and when sharpening them it is only necessary to grind the ends sufficiently to restore the cutting edge and round the nose. The front and side clearance angles are built into the toolholder. Care should be



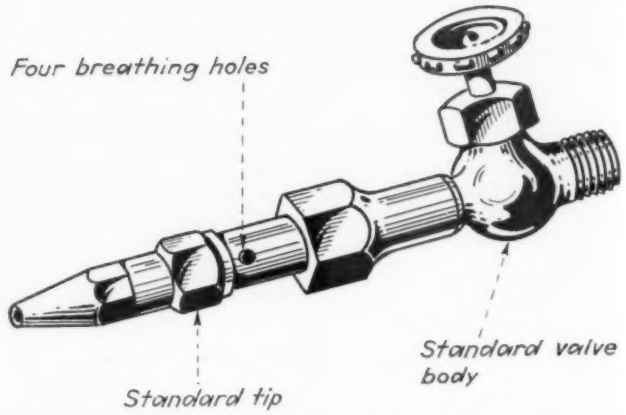
The side and end clearances needed at the work can be built into this toolholder. The toolbit is sharpened by grinding the end to renew the cutting edge

taken in squaring the hole for the bit so that the bit is free from play. With a well made holder a $\frac{3}{8}$-in. bit can be used until it is as short as $\frac{1}{2}$ in. The holder can be machined for the side clearance angle desired, or it may be heated and bent after the hole is drilled and squared parallel with the shank. Three $\frac{1}{4}$-in. setscrews are sufficient to hold the toolbits. Thrust of the work is taken by a $\frac{1}{2}$-in. socket-head setscrew, which is also used to adjust the toolbit. For short bits, a rectangular piece of tool steel can be used ahead of the $\frac{1}{2}$-in. setscrew.

Welding Head for Low-Heat Soldering

BY FRED BARTON

The drawing shows a special welding head developed for soldering operations when using hydrogen. Acetylene can be used for a hotter flame by increasing the length of the injector head and decreasing the diameter of the hole in the injector head.



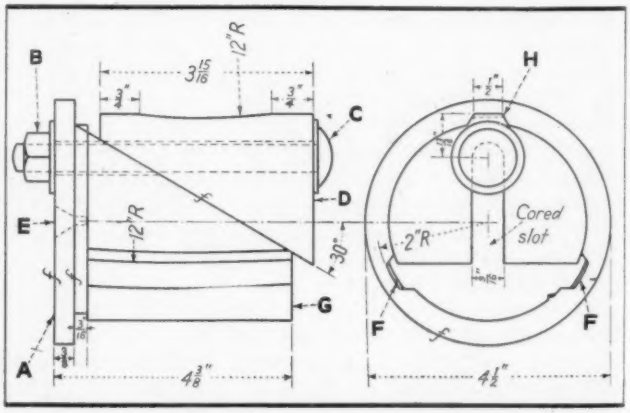
This welding tip reduces the flame temperature from 6,300 F. to 2,000 F. when using hydrogen. It makes possible the use of low-melting solders

When used with hydrogen, this tip gives a flame temperature of approximately 2,000 F. When acetylene is used, the flame temperature is approximately 3,500 F. This makes possible the use of lower melting solders and permits the use of a gas flame on materials that would be injured by the 6,300-F. temperature of an oxy-acetylene flame.

Centering Head for Large Pipe Fitting

BY MARTIN H. BALL

The centering head shown in the drawing is used for facing and turning flanged ends on cast-iron fittings and tubes with cored holes 4 in. in diameter. One centering head is placed in each end of the fitting with $\frac{3}{8}$-in. flange *A* spaced sufficiently from the end to allow room for facing tool. When nut *B* on carriage bolt *C* is drawn up tight,



This wedge-type centering head provides three-point bearing in large pipe fittings so they can be centered in a lathe for turning flange diameters

wedge portion *D* moves outward, expanding the head tightly into the fitting. The fitting can then be mounted between lathe centers, for which the center hole *E* is provided in plate *A*. It is driven by a dog and machined similarly to work on an ordinary mandrel.

The bearing surfaces on ribs *F* of flanged section *G* are convex as shown, while rib *H* on wedge *D* is concave, thus giving a three-point bearing on the work. The self-adjusting rocking motion thus effected provides a solid bearing for the fixture, and centers the rough casting accurately.

Eliminates Hand Cleaning of Ball Bearings

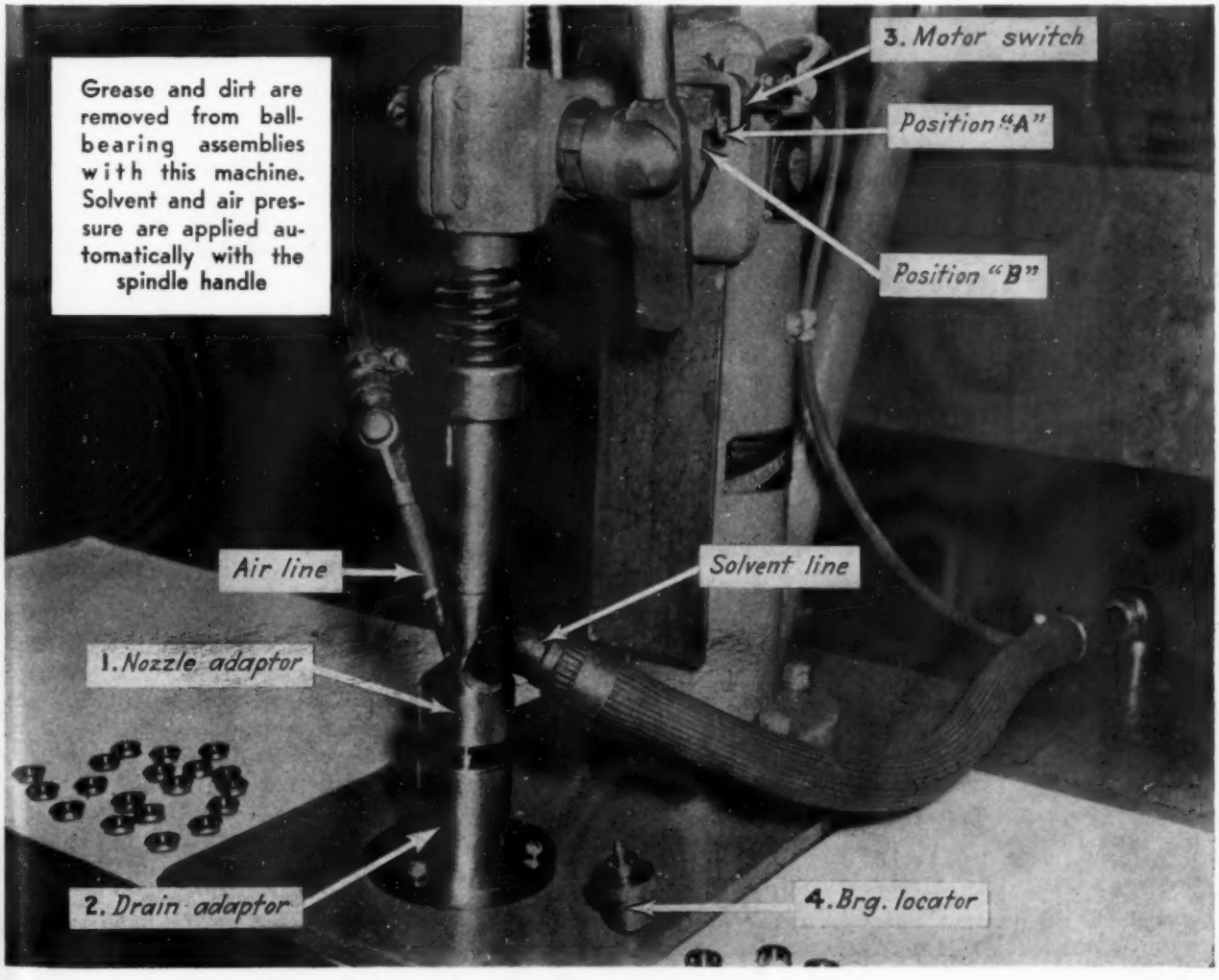
BY D. H. BAUM
Westinghouse Electric & Manufacturing Company

Most ball-bearing failures are caused by dirt and abrasive particles that find their way into the bearings before and during assembly operations. When such bearings must be removed and cleaned, the accepted method is to douse them in a bath of cleaning solvent to remove grease and dirt, and finally blow out the remaining solvent and dirt particles with compressed air. The inner and outer races are held to prevent spinning and avoid possible scratches on the parts. Lubrication with clean grease completes the cycle.

Because this method is slow and frequently does not remove all the dirt, the illustrated machine was developed. A drill-press spindle, salvaged from a scrapped machine, was mounted on a work bench. A reservoir tank for the solvent, a filter, a motor-driven pump and suitable piping were installed under the bench. An adapter with air and solvent outlets was fitted to the spindle and another adapter was fitted to the table to hold the bearings and drain the solvent after cleaning. The motor is operated through the spindle-feed handle which controls a limit switch. Bearing locators are used for each size bearing; these seat the bearings properly and direct the solvent through the races and balls.

The dirty bearing is placed on the locator that is held in the drain adapter. The spindle is brought down to position *A* joining the two adapters tightly and operating the switch to start the motor. Cleaning solvent is pumped through the bearing races and balls at a pressure of 75 lb. per sq. in., flushing the bearing clean. The spindle handle is then moved to position *B* to open the switch and stop the motor. Filtered clean air is blown at high pressure into the nozzle adapter and through the bearings when the handle is in its second position. The nozzle adapter is designed to eliminate bearing spin.

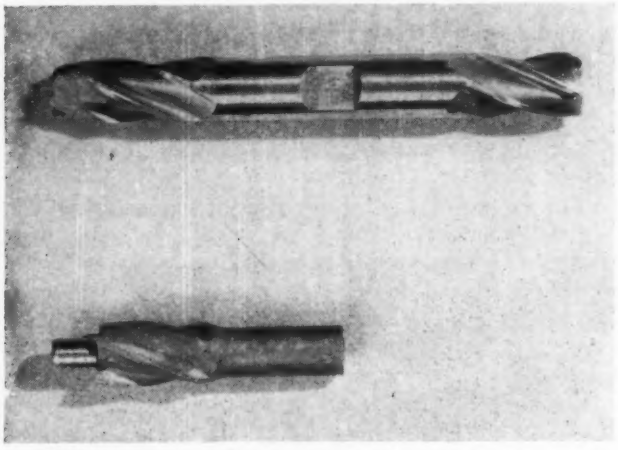
Bearings are cleaned in 38 sec., a saving of 1 min. 44 sec. over the method used formerly. As the bearings are taken from the cleaning machine, they are lubricated and packed in wax paper until ready for use.


Grease and dirt are removed from ball-bearing assemblies with this machine. Solvent and air pressure are applied automatically with the spindle handle
3. Motor switch
Position "A"
Position "B"
Air line
Solvent line
1. Nozzle adaptor
2. Drain adaptor
4. Brg. locator

New Tools From Broken Cutters

BY CHARLES KNOVES

The difficulty in obtaining cutting tools makes it necessary to take every possible means to salvage those that become broken. For example, a broken double end mill can easily be made into two counterbores. This is done by annealing the end mill, cutting it in half, and then chucking each half



Broken end mills, reamers and drills can be salvaged by making other tools from them. Two counterbores were made from this broken double end mill

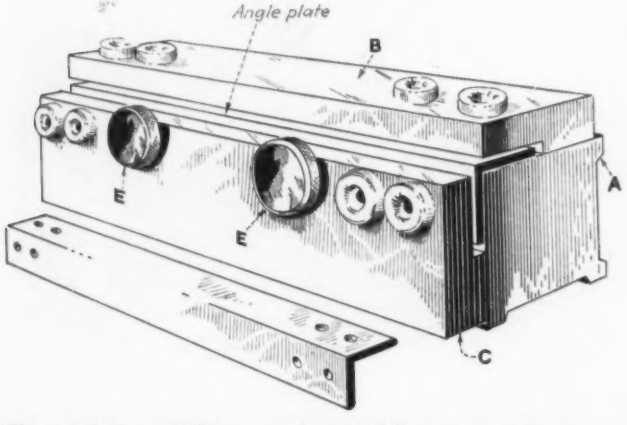
in a lathe to machine the pilot. The shank was turned down, the counterbore backed off, and the tool rehardened.

Reamers and drills can also be salvaged in this manner and various tools made from them. Shops without facilities for doing the work can have it done by commercial toolmakers.

Angle-Iron Drill Jig Costs Little

BY ALEX GEORGE

The inexpensive jig shown in the drawing was made for drilling eight holes in each of 80 pieces of angle iron $\frac{1}{8}$ in. thick with $\frac{1}{2}$ in. legs and $5\frac{1}{2}$ in. long. Block *A* serves as the jig body and was made from machine steel. Two bushing plates *B* and *C* were fitted with screws and dowels. Small pin locates the angle irons from one end, while thumbscrews *E* hold them during the drilling operation. The angles are slipped in from the end opposite the stop pin. Relief holes somewhat larger than the drill size are put in the block *A* and opposite to the drill bushings so the tool can break through the channel without interference. The most expensive parts of this jig are the drill bushings. It was made in two hours, and although it was in use for less than one working day, it saved its cost many times over because it maintained the required accuracy in locating the holes.

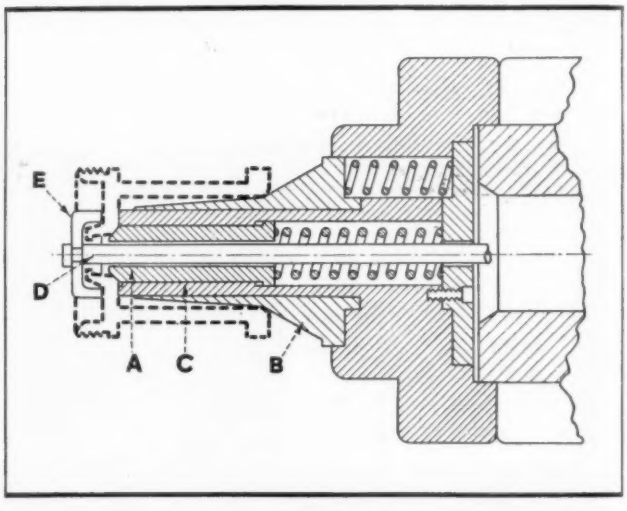


This angle-iron drill jig was designed for a run of 80 pieces to maintain accuracy of hole locations

Spring-Loaded Fixture Centers Castings

BY A. J. GREEN

The illustrated fixture was designed for chucking die castings for small motor end shields preparatory to machining. It employs a spring-mounted tapered plug *A* and a similarly mounted tapered ring *B* which locate the bearing bore and the edge of the stator fit. The end shield is located



Pressure die castings may be held concentric in this spring-loaded air-operated chucking fixture. Three-point loading at the end flange prevents high stresses

against three-point stop *C* which contacts the inside of the end flange, evenly dividing excess stock in the casting. The end shield locates first against spring-mounted plug *A*, assuring a concentric location of the outer end, and then is pushed back until it locates solidly against three-point stop *C*. Coincidently, contact is made at the inner end of the large taper ring *B*, obtaining concentric location of the large fit. The air-operated draw-in bar *D* pulls horseshoe washer *E*, which has three locating points directly opposite the points on stop *C*. Alignment of locating points on the washer and stop avoids distortion.

This arrangement permits the casting to be held solidly and accurately without stressing any of the weaker sections, since the holding force is applied directly in compression against three points through the end flange. Turning operations may be done quickly by relatively inexperienced operators.

Postwar Tool Surplus Stirs Debate

Most Readers Agree That Used Tools Should Be Withheld From the Postwar Market

AS POSTWAR DISPOSITION of surplus machine tools is more widely discussed, Roy Porter's recent article arouses an increasing number of comments: some agree with his suggestions that tools be held in readiness, in arsenals or stored in government-owned plants, for gradual absorption by the machine tool market through sales by their original builders; others have widely divergent or conflicting views of the solution.

The vice president and sales manager of a machine tool manufacturer states, "Mr. Porter's plan would benefit the machine tool dealers more than the builders. Quite obviously if there are a surplus of used machine tools, there would be no cause to build new ones. Builders would get but inconsequential plant activity rebuilding used machine tools."

Similarly, E. A. Miller, chairman of the board, The King Machine Tool Company, Cincinnati, writes, "It does not appear that Mr. Porter's plan has any connection with the production of machine tools. It would place no other work in our plants than the reconditioning of used machines. It does not stimulate a market for our industry's products."

Writes August Marx, vice president and general manager, The G.A. Gray Company, Cincinnati, "Mr. Porter's solution is hardly adequate. Turning our machine tool plants into machine tool repair shops, and our salesmen and those of our agents into second-hand dealers, may keep the wolf one step from the door for a few months, but that is about all it would do.

"The United States can afford to sell Defense Plant Corporation tools cheaply for foreign rehabilitation purposes, that American machine tool builders will not meet ruinous competition from the used tool market, and so that those American factories that will retool or increase their tooling after the war will have the most modern equipment with which to face postwar problems."

Oppose Foreign Shipments

Opposition to the lend-leasing of tools to foreign countries for rehabilitation has been expressed by the chairman of a drill manufacturing company, who writes, "Such a program would stultify our export market. Many of us have depended in normal times upon the export market for one-quarter to one-third our sales, and it is just as bad to glut the foreign market as it is to load the domestic one. A far better plan would be to retain all machine tools in every government arsenal, navy yard, defense and other plants for a period of at least ten years, and maybe longer for the next emergency. They should be retained there at least until the surplus has been absorbed. We could then determine whether or not to scrap such machines, sell them, or replace them with more modern ones. But we must keep our national defense plants tooled up ready for business."

He also opposes the equipping of schools and colleges with these surplus tools, for "that again only stultifies the market for even newer and better machine tools."

Similarly, U. Seth Eberhardt, vice president and treasurer, Newark Gear Cutting Machine Company, writes, "We do not believe the answer is to ship these machines to Asia and Africa as some people are proposing."

Doesn't Expect "Dumping"

The vice president of a company producing abrasive equipment has faith in the government's handling of the situation, and writes, "By experience the government has learned the importance of preparedness. I believe that, combining the problems of surplus factories and surplus machinery, a good many of these plants will remain equipped as standbys long after the war ends. Even if later they are allowed to filter out into general industry, or into the rehabilitation of Europe and the industrialization of such countries as India and China, the breathing spell thereby provided will soften the blow to the machine tool industry."

But, writes R. K. LeBlond, chairman, The R. K. LeBlond Machine Tool Company, Cincinnati, "Roy Porter has overlooked the storage of these machines and whether the government could keep them. In our case, for instance, it would be impossible for us to store the number of machines that would be returned."

Withholding used tools from the market is urged in one way or another by most commentators. The treasurer of a grinding machine company suggests that, "If the government sells equipment to present operators, a clause should be included in the contract preventing it from being resold within ten years. The low price at which equipment would probably be sold to the present operator would justify this.

Would Scrap "Dogs"

"It would also be advisable to scrap any machines that require considerable rebuilding. Standards of condition should be set up, the machines surveyed and those below the standard scrapped. This would not cost the government very much in loss of potential sales, for such machines are not going to bring very good prices if sold in competition with better machines."

The problem of wartime overproduction and over-expansion is not going to be limited to the machine tool industry, points out G. H. Fobian, vice president, The Oilgear Company, Milwaukee. "The situation which will confront the machine tool industry at war's end will be experienced by other industries whose peacetime production rates and facilities have been expanded. Such industries are essential to both peace and wartime economy, and our national policy should be shaped to enable them to survive and to continue operations at a level permitting rapid expansion to meet any future emergency."

I do not advocate "government subsidy for these industries," he continues. But I do advocate "prompt sales of such defense plants and equipment as can be sold to present lessees under existing option agreements. Should any be sold at prices lower than would obtain under the lease price formula, a restriction could be placed in the sales contract to prevent their resale except in connection with the sale of the purchaser's business, until seven years after the date of purchase. There appears no logical nor legal basis for the intervention of a machine tool manufacturer or his dealer in such transactions."

Mr. Fobian's further suggestions include the creation of ordnance maintenance plants, standby plants and the establishment of a pool of standby machine tools and other equipment, stored in government depots. He would dispose of the balance through supplying them "to war-torn nations to replace plants for peacetime economy."

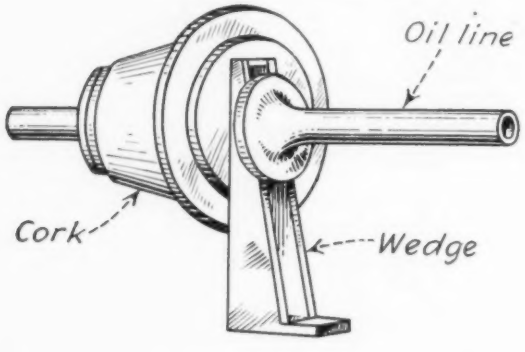
War Winning SUGGESTIONS

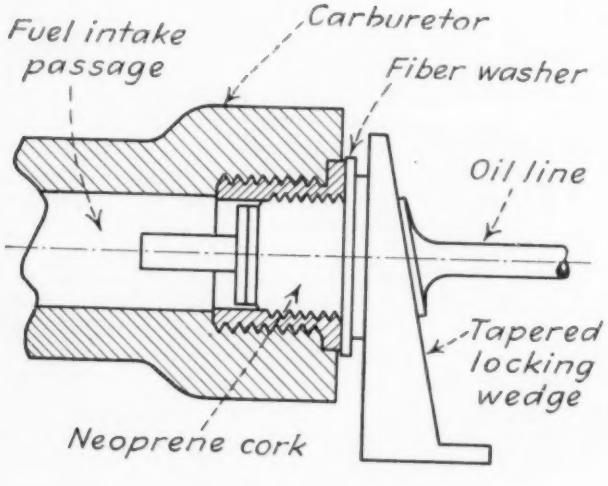
The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.

Fittings Made From Synthetic Rubber

After airplane engines have been tested by the manufacturer, the carburetors are flushed with oil to remove gasoline from the diaphragm and interior of the carburetor body. This is a safety measure, preparatory to shipment. The oil pressure line is usually connected to the fuel intake passage by means of a threaded coupling, the assembly of which often takes longer than the actual cleaning of the carburetor.

The threaded coupling can be replaced by one consisting of a tapered neoprene cork and a tapered locking wedge, with a fiber washer between these two parts to distribute uniformly the thrust on the cork. The cork is inserted into the threaded intake passage as shown in the drawing, and is then tightened by driving the tapered wedge against the fiber washer. The pressure thus exerted by the wedge forces the neoprene into the threads, forming a tight seal. This synthetic rubber fitting decreases by 50 percent the time required to attach and disconnect the oil line. *Suggested by August Pepka, Aircraft Engine Division, Packard Motor Car Company.*





Concrete As Ballast for Locomotive Cranes

Car-body ballast for locomotive cranes is usually scrap metal, which can be removed easily when making periodic inspection of the underframe and car body. Such ballast is held in position on the car bottom by steel sheets and supports. The floor above the ballast is made of safety tread sheet metal supported by steel channels.

Concrete was used originally as ballast in some cranes, but it disintegrated after moderate service and large pieces fell through to the track. In one case this interfered with the car truck while rounding a curve and caused a derailment. As originally used the concrete was difficult to remove when inspecting the cranes; therefore, it was discarded in favor of metal which had the added advantage of increased weight per cubic foot.

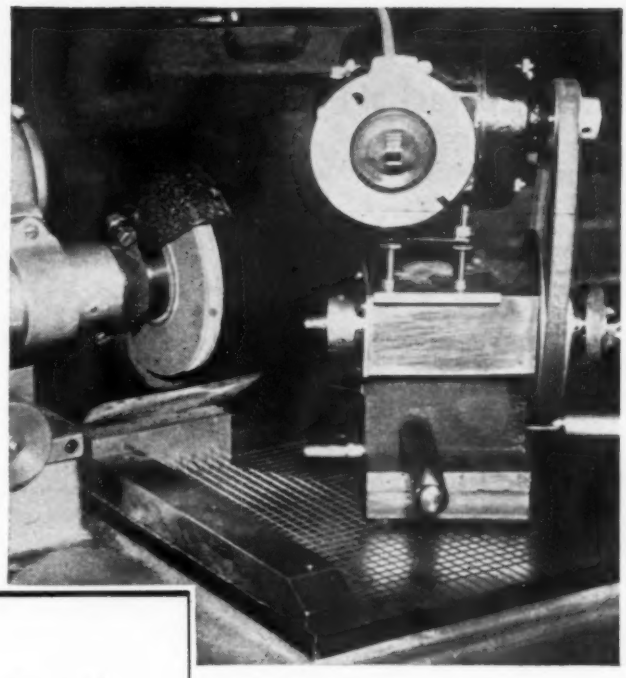
These objections to the use of concrete are secondary to the need today for saving scrap metal. Concrete can and should be used if proper consideration is given to the design of the car-body cavity. In some cases the present cavity can be filled with concrete without alterations; however, the car should be cleaned and leaded first. In other cases the bottom supports, the lower floor, and the sides can be designed to hold large blocks of concrete; in addition, the cavity can be made tight enough to pack the blocks in sand—that prevents the blocks from pounding against each other and breaking. Such blocks are easily removed for inspecting the underframe and car body. If poured properly, the top surfaces can be sloped to drain water from the crane floor, thereby eliminating the need for safety tread flooring. The safety-treaded sheets, which measure approximately 4x10 ft., need not be scrapped, but can be used elsewhere on the railroad. *Suggested by Charles A. Gordon, Illinois Central System.*

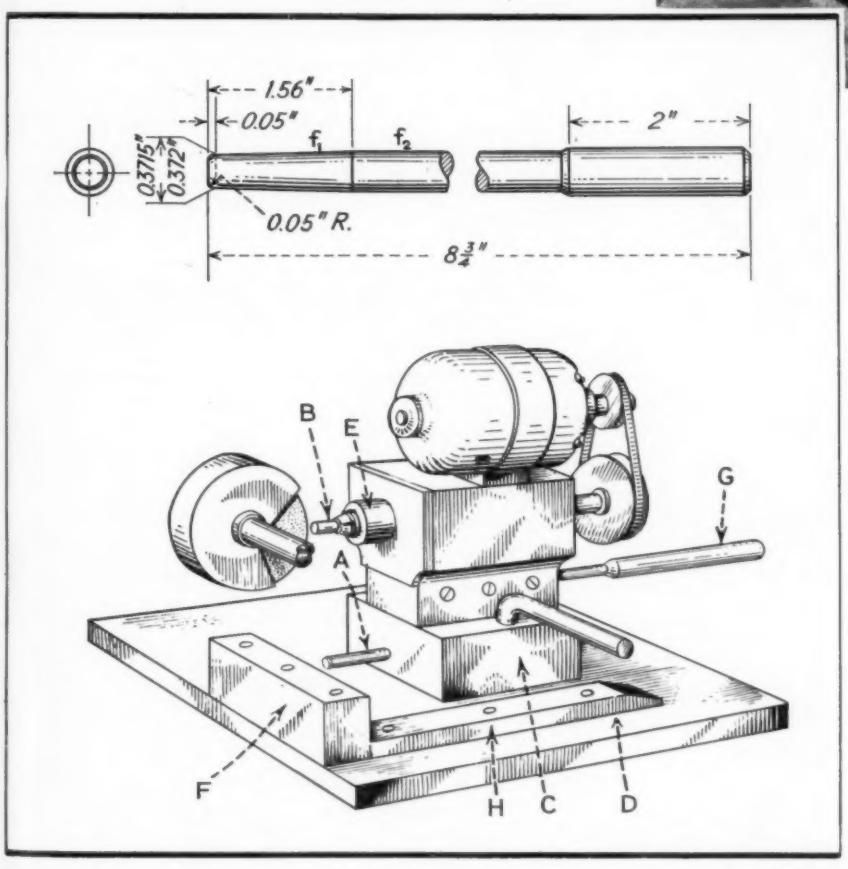
Radii Grinder for Draw Punches

When an automatic lathe and a centerless grinder were set up to make draw punches in production lots, inaccuracies in the machined taper diameter and over-all length of the punch made grinding costly. Therefore, the illustrated grinding set-up was devised with which it is possible to grind the end radius and taper to proper length in minimum time even when machining inaccuracies are present.

This grinding unit is essentially a means of reproducing a shape from a master. Master *A* and work *B* are held in a cast-iron block *C*, which can be moved freely in any direction on the top of surface plate *D*. The grinding wheel is rigidly mounted adjacent to plate *D*, and can be adjusted by a setscrew to compensate for wheel wear. Work *B* held in spindle *E* is revolved by a motor and belt drive which are an integral part of block *C*.

Master *A* makes contact with guide block *F* at the same time the work touches the grinding wheel. Block *C* is then moved by sliding and twisting, keeping the master in contact with the master block until the work has sparked out.





The work is held in spindle *E*, the taper bore of which is ground and lapped to fit the taper on the punch. Herein lies the success of the grinding unit. All variations in the diameter or length of the taper are corrected because the master is set in the proper relationship to this taper, the setting being made by a screw adjustment and locknut incorporated in handle *G*. When the work is finished and the proper shape on the end of the punch is attained, the correct diameter at the end of the taper is obtained automatically. This reduces the skill required to operate the grinding unit.

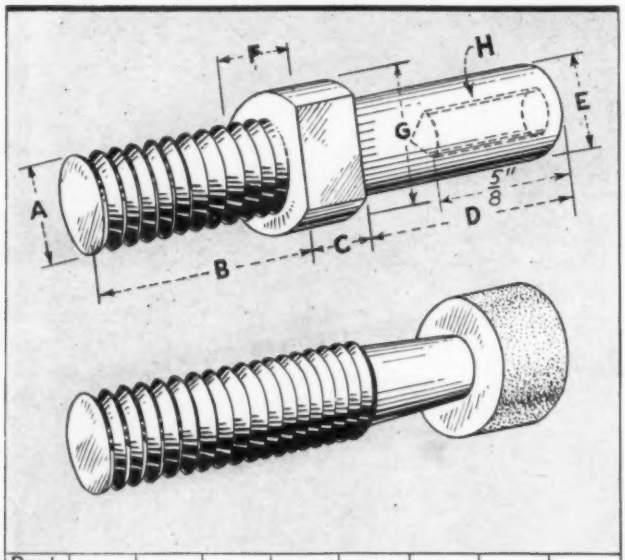
A diamond for dressing the grinding wheel is located on the back of block *C*. It is set on the plane of the grinding wheel spindle, and can be adjusted so that it too is in correct relationship to the tapered hole in the work spindle. Once the diamond is set, the wheel is dressed so that it automatically produces the correct dimensions on the punch. After the diamond is adjusted, the grinding wheel is fed forward by screw adjustment and the diamond passed across the wheel by moving block *C* against the side of master block *F*. Guide block *H* at the end of master block *F* keeps block *C* from sliding off the plate while dressing the wheel.

This method of grinding the radius and diameter required on the end of the punch reduces skill needed and obtains close results.

The cost of making a drawing punch by conventional toolroom practice was 42.5 cents. This was reduced to 20.8 cents by the first production grinding set-up. The method herein described further reduced the cost to 13.4 cents. Annual savings effected through the use of the described unit is expected to reach $7,000. *Suggested by Frank Iacobelli, Winchester Repeating Arms Company.*

Overcomes Lack of Grinding Wheel Spindles

At present there are about fifteen different size bores in cones being produced for an ordnance item. If no change is made in the present method of grinding the bores, at least twelve different spindles are required to do this work correctly. This entailed no difficulty until it became necessary to use the grinding equipment on another job, leaving only three spindles available for hand grinders working on the cones. For some time the cones were ground with the avail-



Part No.	A	B	C	D	E	F	G	H
1	3/8-16	7/8	1/4	3/4	1/4	5/8	3/4	6-32
2	3/8-16	7/8	1/4	3/4	3/8	5/8	3/4	6-32
3	3/8-16	7/8	1/4	3/4	3/8	5/8	3/4	8-32
4	3/8-16	7/8	1/4	1 1/8	7/16	5/8	3/4	1/4-20
5	3/8-16	7/8	1/4	1 1/4	1/2	5/8	3/4	1/4-20
6	3/8-16	7/8	1/4	1 1/2	5/8	5/8	3/4	1/4-20
7	3/8-16	7/8	1/4	2	3/4	5/8	3/4	1/4-20

able equipment, but in some cases the spindle used was not the best fit for the size hole to be ground, while in others the peripheral speed of the spindle was too slow. In additional cases, work had to be stopped until a spindle of the correct size could be borrowed from another grinder then in service.

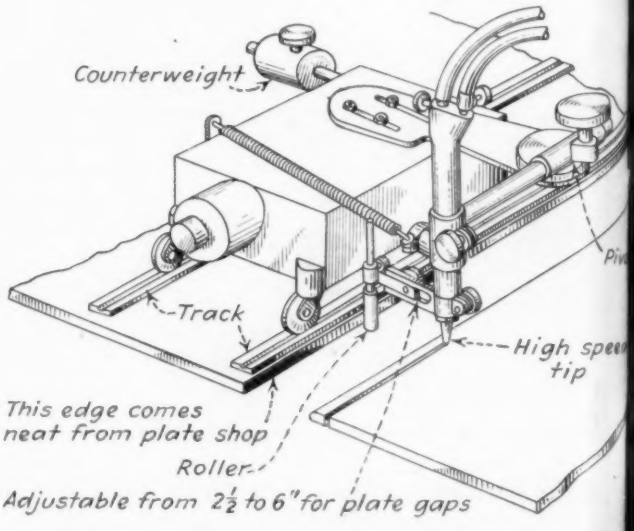
To overcome this condition, seven detachable noses were made for the three available spindles. As shown in the drawing, the threaded fit for the spindle and the threads for the grinding wheel shank are held concentric. The noses have been designed in such a way that in addition to taking all the different sizes of bores in the cones, they also will accommodate all sizes and types of small grinding wheels in stock. Their adoption has increased production more than 25 percent. *Suggested by Joseph Kautsky, Link-Belt Company.*

Plates Cut Parallel for Flanging

Prior to the introduction of the illustrated torch-holding attachment for trimming edges of shell and bulkhead plates for Liberty ships, the procedure was to space the plates correctly and flame cut the confronting edges with twin torches. The plates were spaced by bolted ties, which had to be removed and replaced as the cutting torches passed down the plates. Stopping the torches cause unevenness in the plate edges. The plates then had to be trimmed by hand grinding.

The procedure in trimming a shell plate was to overlap the wild edge of the bottom plate with the neat edge of the center plate of the shell unit, tack weld the plates together by means of special saddles, grind off irregularities on the flame-cut edge, test-flange the plates, and successively grind and fit the plates until the edges came together satisfactorily. Five shell plates could be flanged and subsequently welded in eight hours by this method.

Fourteen plates can now be flanged and welded in eight hours using the illustrated flame-cutting attachment. The plates may be spaced anywhere from 2½ to 6 in. apart as long as their respective edges are nearly parallel. The machine is run along a track carried by the center plate; the torch trims off the weld edge of the other plate to the exact contour of the neat edge, since it is guided and held in spaced relation to the neat edge by a roller that bears against the neat edge.



The trim cut exactly duplicates the neat edge of the center plate; therefore, the plates may be flanged immediately to form a good fit. The neatness of the joint effects an increase in welding speed, since there is no tendency to blow-through on the tightly joined plates. *Suggested by A. H. Privett, Richmond Shipyard No. 1, Permanente Metals Corporation.*

Armament

SECTION OF AMERICAN MACHINIST

Hot Cupping Used By Buick for 75-mm. Steel Cartridge Cases

Successful mass production of steel cartridge cases has been realized by a number of companies and several processes are in use. Here is the first detailed explanation of one method

TOWARD THE CLOSE of the World War, salvage crews picked up German-made steel cartridge cases from the battlefields of France. The enemy's development work was evidently not then completely successful, for ammunition boxes bore the warning, "For Barrage Use Only."

Over the next twenty years, the perfection of the steel cartridge case occupied the attention of arsenal technicians throughout the world. Two reasons prompted the effort: (1) to save copper, which is the principal constituent of brass, and (2) to obtain a case that can be reloaded a large number of times. The primer hole in the brass case is said to become unserviceable after relatively few firings.

For one reason or another these peacetime efforts were unsuccessful, so far as the United Nations were concerned. It was not until early in the present conflict that a satisfactory experimental replacement

for the brass case was produced—by an American company at the request of the Canadian government. At the time, however, this process required the use of a highly alloyed steel and a number of critical heat-treatments in specialized furnace equipment, although it did establish a method of drawing steel cartridge cases.

Other manufacturers, including the Buick Motor Division of General Motors, had become interested in the problem, as the result of requests from Army and Navy authorities, especially for shell cases using a minimum of alloy materials. It was soon seen that the production of steel shell cases is a matter of first magnitude in respect to metallurgical and production aspects, and hence the Cartridge Case Industrial Committee was set upon May 4, 1942 with members from Ordnance and industry. Successful results have accrued from this cooperative program. According to latest reports, steel cartridge cases are being produced in volume, in practically all calibers, by several processes.

With any of these processes, there is practically no permissable tolerance in the physical properties of the steel shell case. If it is too hard or brittle, it will crack when fired, and if it is too soft, the explosion pressure will cause the metal to take a permanent set and stick in the gun barrel.

The purpose of a cartridge case is to act as a container for the explosive charge, to prevent the escape of gases resulting from the explosion and to permit more rapid firing than would be possible without fixed ammunition.

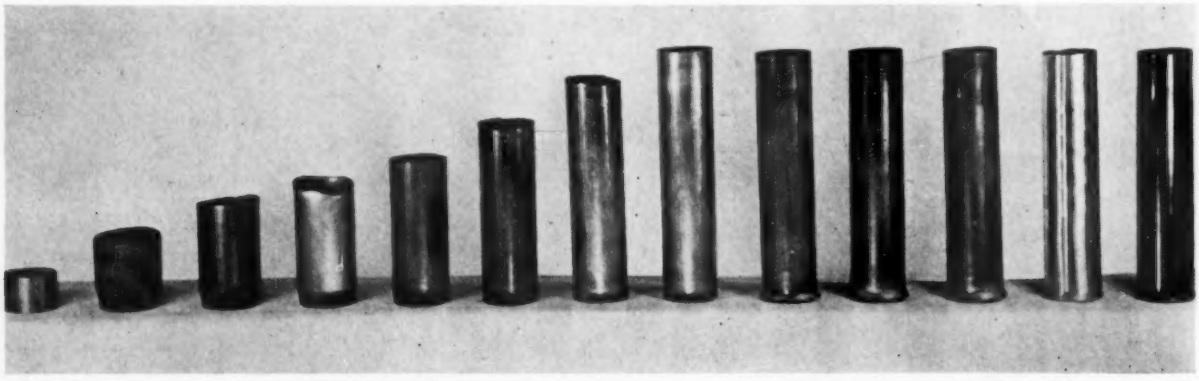
A certain amount of clearance is necessary between the cartridge case and the breech wall to permit ease of loading and ejection. The cartridge case must expand, first to take up this clearance, and continue to expand as the breech diameter increases because of the explosion pressure. Then the case must have enough elastic recovery to allow easy ejection after firing. In contrast to the high physical properties required in the body of the cartridge case, the mouth must be annealed to permit closure upon the projectile.

Thus, the material selected for a steel cartridge case must possess a certain combination of strength and ductility for successful performance. It is necessary to have a higher yield strength on a steel cartridge case than on a brass one because of the higher modulus of elasticity of steel. The modulus of steel is 30,000,000; that for brass is 14,000,000. The stress within the elastic range to produce a given amount of strain in brass is therefore approximately half that for steel. For the 75 mm. cartridge case it is essential to produce in the body a yield point of at least 105,000 lb. per sq. in. and a ductility of at least 5 percent.

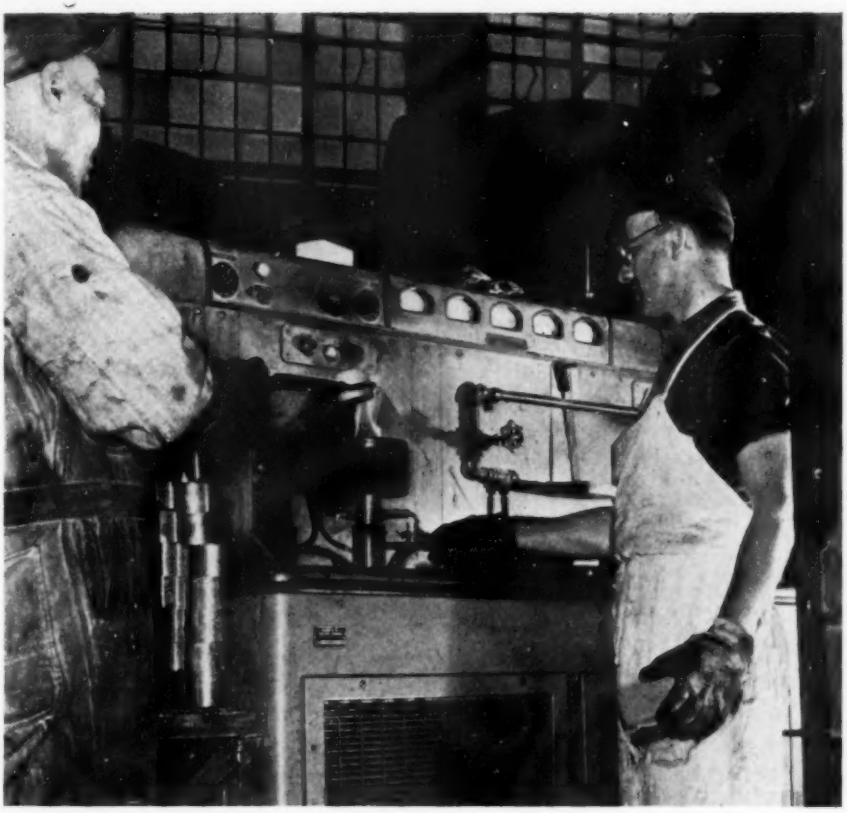
Methods for Attaining Physical Properties

The required physical properties can be obtained either by cold working alone, or by quenching and tempering before or after cold working. Cold working alone requires the least number of operations, fewer shop problems, less equipment, according to Buick. Quenching after cold working results in distortion of the case, which must be controlled by intricate quenching dies, or by additional sizing operations. Quenching followed by cold working eliminates the distortion problem and has been employed successfully on experimental lots. Where cold working alone, or quenching before cold working, is employed, a final stress relieving treatment should be used to improve further the physical properties.

In selection of material, Buick chose to work along the line of a low-carbon steel which could be cold worked and stress relieved to the required physical properties without resorting to a spheroidizing treatment prior to cold forming. Among compositions tried during the development stage were SAE 1015, 1016 and 1020, AISI C-1019, and a higher manganese type containing 0.20 carbon and 1.29 manga-



Forty-three operations, twice the number for the 75-mm. brass cartridge case, are required to produce the steel replacement, but the cost of the two is now practically the same. Stages in forming the case are shown



Slugs are raised to forging temperature so rapidly by induction heating that scale is minimized, thereby saving wear on the extrusion dies

Fig. 1—Experimental extruding dies were made to produce a domed head on the cup

Fig. 2—Cold shuts in the heading operation produced cracks

BUICK OPERATIONS ON THE 75-MM STEEL CARTRIDGE CASE

1. Cut slugs from bar stock, three bars at once, in Motch & Merryweather cold saw.
2. Centerless grind the outside diameter of the blanks, to remove surface imperfections.
3. Magnaflux to discover any remaining seams or scratches, and rinse.
4. Blow off water droplets with compressed air.
5. Heat to forging temperature in Tocco induction heating equipment.
6. Extrude, or cup, to a cavity depth of 4 in. on a 1000-ton Ajax press.
7. Redraw to 6 in. depth on falling temperature.
8. Size wall thickness to limit of 0.006 in., without extending shell case appreciably. Accurate sizing here avoids excessive trim allowance.
9. Anneal in Holcroft pusher-type gas furnace.
10. Pickle to remove scale and rinse.
11. Coin taper at base of cup to work-harden metal prior to heading.
12. Chemically treat metal surface with Bonderite D solution.
13. Stress relieve to remove hydrogen embrittlement resulting from Bonderite treatment.
14. Trim mouth on press because of wall thickness.
15. Cold draw in four successive operations.
16. Inspect for scratches, size, out-of-roundness.
17. Alkali wash.
18. Trim mouth on V & O machine and burr edge.
19. Renew Bonderite coating.
20. Stress relieve to remove hydrogen embrittlement resulting from second Bonderite treatment.
21. Head cold in two successive die positions.
22. Wash.
23. Flame anneal mouth end for 2 in.
24. Taper the mouth and size the neck on two dies set up in one press.
25. Wash to remove lubricant, to avoid burnt deposits in subsequent operation.
26. Flame anneal mouth for distance of 3½ in.
27. Machine the base and bore the primer hole on automatics.
28. Burr inner end of primer hole and wire brush interior of case
29. Face to length within 0.040 in. on V & O trimming machine.
30. Rough counterbore and rough ream primer hole.
31. Finish counterbore and finish ream primer hole.
32. Alkali wash.
33. Light burr the mouth.
34. Burr counterbore and wirebrush.
35. Gage and inspect complete.
36. Stress relieve at lower temperature.
37. Dip in 5 percent sulphuric acid at 160 F.
38. Wash in water and then in "Sol-Klean" and dry.
39. Wipe loose oxides from cleaning process.
40. Spray phenolic varnish on interior and exterior of shell case.
41. Bake 24 min. in infra-red lamp oven.
42. Inspect.
43. Pack and ship.

nese. Experimental lots of C-1019 included coarse grained, fine grained, aluminum killed and silicon killed steels.

The composition finally adopted, and now in production, is an open hearth, high manganese, aluminum killed, fine grained carbon steel.

The Buick development is noteworthy for cold working this steel to more than the required physical properties. A small amount of a single alloying element would make the problem much easier.

Quality in the raw material is of utmost importance. Best mill practice with regard to discard, surface conditioning and macrostructure is essential in producing suitable steel for cartridge cases.

Hot Cupping Avoids Trouble

The Buick process for drawing steel cartridge cases may be distinguished from others by the term "hot cup method." Some manufacturers prefer to cold work a blank cut from plate by a process successfully developed through private enterprise. The Flint concern prefers, however, to extrude a heated slug cut from bar stock and measuring $3\frac{1}{8}$ in. in diameter by $1\frac{3}{4}$ in. thick. By some 43 operations the slug is converted to a finished 75-mm. shell case at a cost that may soon equal that for the brass counterpart, even though labor costs are high. Practically all operations are carried out with converted automobile-plant equipment.

For proper extrusion, slugs must be cut off square from the bar stock. For this reason, Motch & Merryweather cold saws were chosen. By feeding three bars at once through the machine vise, it is possible to obtain three slugs in a cycle of 1 min. 10 sec. Originally the edges of the slug were chamfered after the sawing operation, but this step is no longer required because the cupping die has been developed to take a square-edged blank.

Centerless grinding equipment on hand would not receive bar stock for the purpose of removing surface imperfections that would be carried through the manufacturing processes. Hence the slugs are passed through three centerless grinders on work trays, each machine removing about a third of the total ground off, or 0.025 in. Magnaflux inspection determines whether the ground outside diameter of the slug contains residual pits, seams, scratches or other imperfections that would affect shell-case quality.

Slugs are brought to forging temperature on Tocco induction heating equipment. The first installation

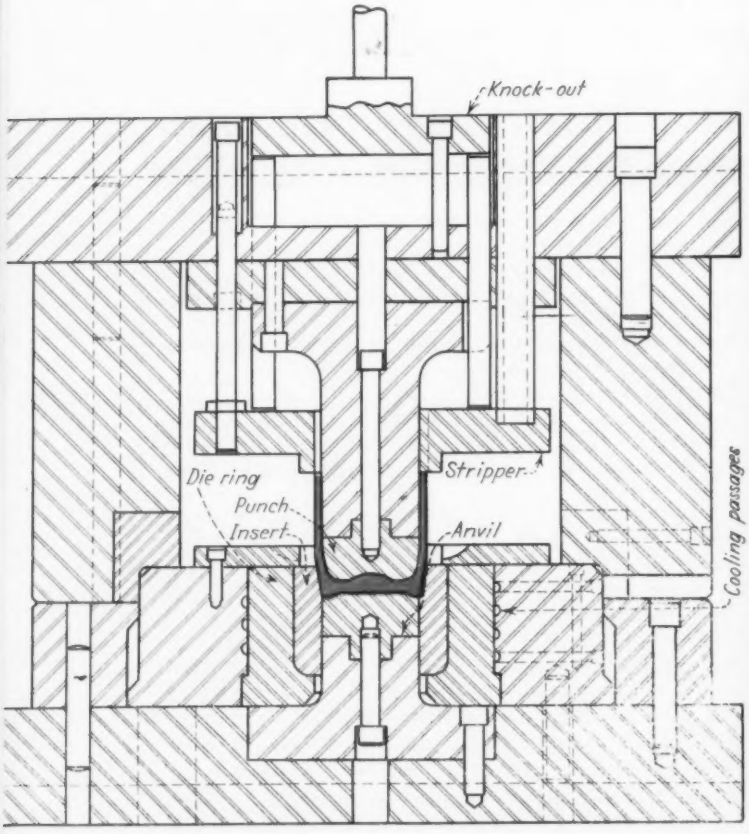
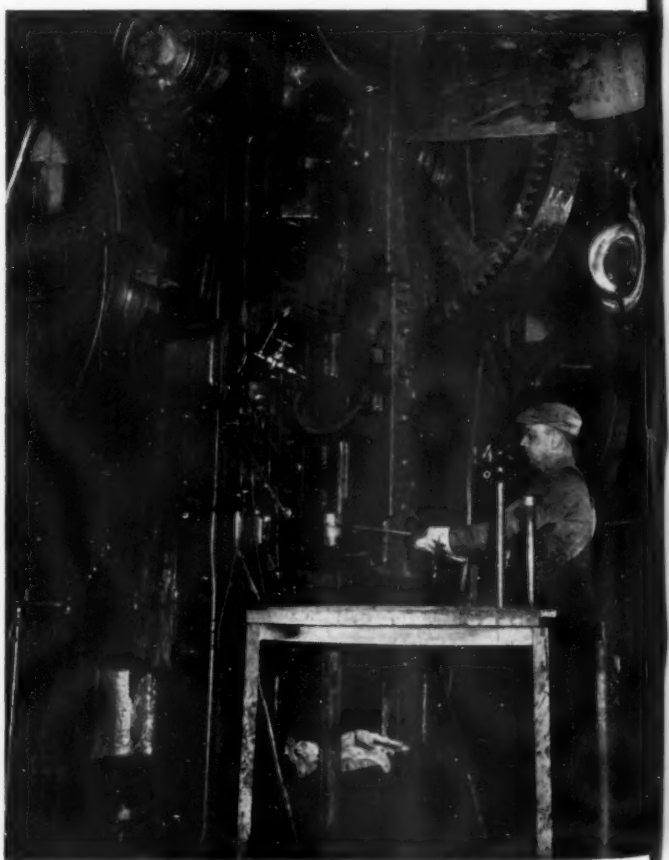


Fig. 3—With the cross-section shown for the extruded cup, sufficient metal is left in the head for subsequent cold working, and displacement of metal in the heading operation does not alter grain flow



Extruded cups are redrawn from a 4 to 6 in. length while still hot. This operation thins the body before cold sizing but does not disturb the head

comprised a machine capable of heating 80 slugs per hour in two fixtures. New equipment will be expected to handle 200 slugs per hour.

During the brief heating period, 1½ min. on this machine, the workpiece is enveloped with a yellow gas flame to prevent scaling. The current kicks off when the piece is brought to temperature, and the slug is then transferred to a gas-fired muffle furnace for a period of seven minutes, to soak until the center of the piece is up to temperature.

The new and faster Tocco equipment will not require a soaking period. It is probable that the work will be supported within a quartz tube, within which will rise a protective atmosphere generated by a gas flame. When the part is up to temperature it will drop down the tube and be shot immediately to the cupping press.

The cupping operation was a major stumbling block encountered by those who attempted to make the steel cartridge case. When Buick first undertook a development program at the request of the Navy, it was decided to do the job hot, and to make dies of a third size for the 5-in. cartridge case. Tool design was predicated upon the idea that a long thin wall must be extruded in the first operation.

It was found easy enough to produce a forging 13 in. long and with a wall thickness of ⅛ in., but insufficient metal was left in the head for cold working. For this reason, when the 75-mm. shell case was attempted upon an educational order for the Army, the extrusion was finally limited to 4 in. in height, which gives a 0.256 in. wall thickness for subsequent reduction in a hot redraw operation and four cold drawing operations.

These early experiments also disclosed that the shape of the head must be different from practice employed for brass cases, to avoid cold shuts. If a dome-like head, Fig. 1, is used as in brass practice, the heading operation disturbs grain flow. Cracks running through the wall near the head were discovered after the heading operation.

Punch Angle Aids Extrusion

This difficulty is overcome by the shape of the head produced in the cupping die, Fig. 3. The only metal displaced by heading is that in the "legs," and continuity of grain flow is maintained from the head into the side wall. The cupping die illustrated is an air-operated type capable of a long stroke. While still used in production, additional tools are made like conventional forging dies.

A 14-deg. angle is used for the die opening and the tip of the punch to promote extrusion in the cupping operation. This angle reduces friction on the punch and increases its life to 4500 pieces per dressing. The forging is actually produced with an internal diameter larger than the punch. Even when the piece has cooled it can be slid over the punch.

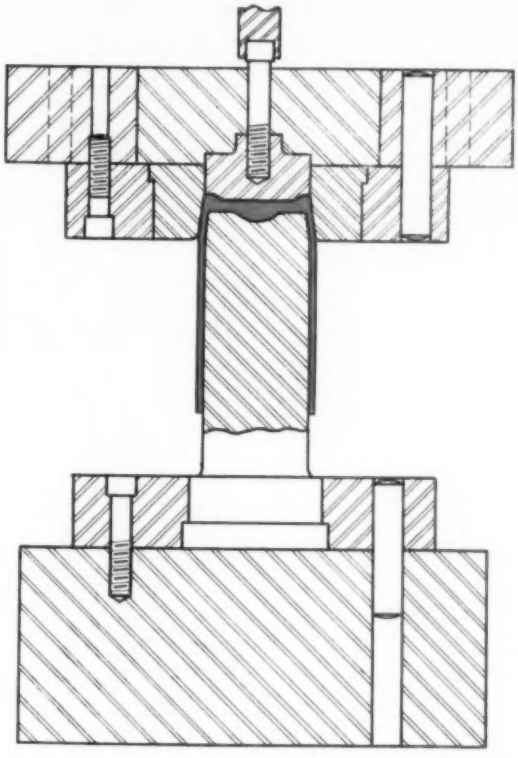


Fig. 4—Physical properties of the tapering wall near the head are increased by coining, to offset the lack of sufficient metal reduction in this localized area by the subsequent cold drawing operations

While the metal is still plastic, the cup is redrawn to a 6-in. depth. At the bottom of the stroke, compressed air is admitted through the punch post to blow the stripped forging down through the press bed opening and up a tube that discharges to a steel skid box. Incorporation of this form of knockout speeds press operation. Air pressure at 12 lb. per sq. in. causes high-speed delivery of the workpiece, and hence it is essential to provide a backstop at the end of the delivery tube.

The redraw die, the cold-sizing die and the four cold-drawing dies are similar to those employed for brass cartridge cases. Punch posts are made from nitrided molybdenum 0.45 carbon high-speed steel; die rings have tungsten carbide inserts for wear resistance.

At this point there is introduced another operation upon which rests the success of the Buick process. It consists of coining a taper at the junction of the side wall and head. Coining is done with the die shown in Fig. 4.

The reason for this operation is that the localized area in question can not be sufficiently cold worked by cold drawing to attain the desired physical prop-

erties. If cold drawing alone is done, the metal reduction in the thin section is at least 40 percent, whereas that in the thicker section near the head is only about 15 percent. It is impossible to bring up the thicker section to the desired physical properties by continued redrawing without rupturing the body of the shell case. In other words, without cold working the localized area before redrawing, the metal would have insufficient elastic recovery near the head and the case would stick in the breech chamber.

By coining, the metal reduction achieved in the critical area amounts to approximately 30 percent. When followed by cold drawing, all portions of the wall show surprisingly uniform hardness.

At the government's request Buick has eliminated copper plating, which was used to prevent scoring in the cold drawing operations. The annealed taper-coined forging is given a zinc-phosphate coating by the Bonderite D process, and the coating is purposely made coarse grained to absorb drawing compound. Buick technicians do not say that the Bonderite coating is better than copper plating, but they do assert that it is simpler and cheaper to apply in production.

To attain the coarse-grained coating which will absorb oil, the technique is varied from that required to achieve a fine-grained surface intended to receive paint. The shell cases are tumbled in alkali for about 5 min. Either alkali or acid pre-cleaning of the metal assists formation of a coarse-grained structure in the Bonderite coating. After the alkali wash, the work is thoroughly rinsed, then immersed in a 20-point Bonderite D solution for 10 min. A cold rinse follows, then a hot one to promote rapid dry-off. A stress-relieving treatment is required at this point to remove hydrogen embrittlement of the steel that occurs as a result of the Bonderite treatment.

Wall thickness of the cold-sized forging is too thick for trimming on a V. & O. machine. Hence, it is press trimmed.

A 750-ton Clearing double-acting press salvaged from automotive operations is employed for drawing the shell case in four stages. The four punch and die stations are placed to form a rectangle well within the 144 x 70 in. platen area. Die design has been worked out so that metal reduction is approximately 25 percent in each operation. The cartridge case progresses from the left-hand die to the right-hand die on one side of the press and is then handed through the die opening to the die opposite the second station, finally moving to the right-hand die on that side. Four operators handle the press, one on each die. Each die has an integral mechanical stripper that removes the part after drawing.

The total draw in these operations is 9 in. but with no substantial change in diameter. Few cases are split or torn, and the trim allowance is rather short.

Die rings in the drawing dies are tungsten carbide and do not wear. The wear falls upon the punch. When the post wears 0.002 in. undersize, the piece is made too thin, and the punch must be redressed.

Successful drawing under these severe conditions is promoted by the drawing compound, which represents considerable development by Buick. The composition of this material is: one barrel of Gilleron drawing compound, two gallons of Moto Mica, two gallons of graphite, one gallon of stearic acid, seven

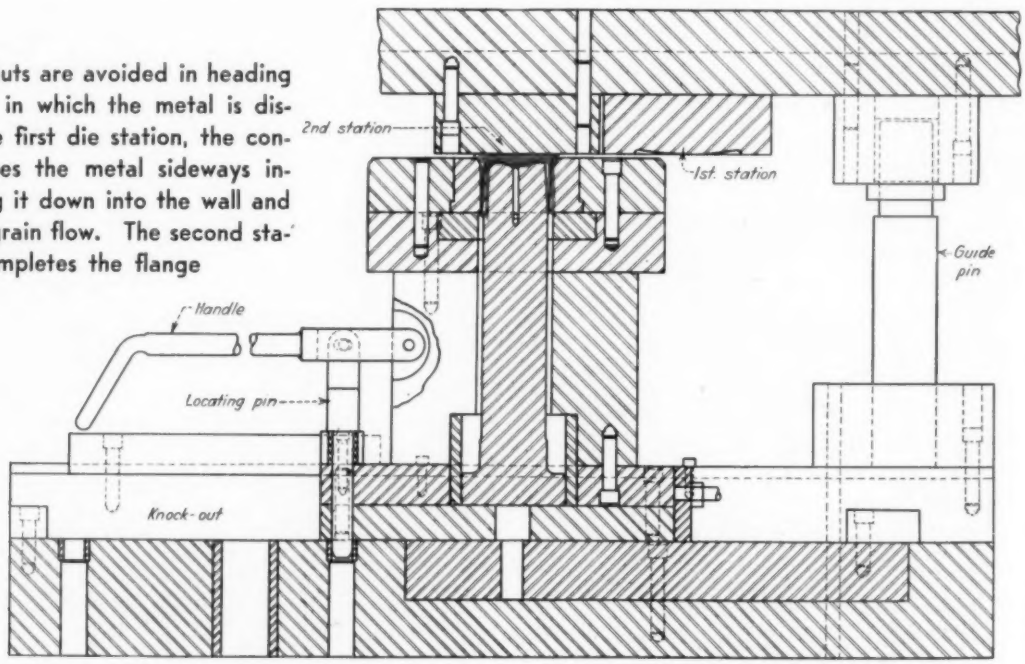
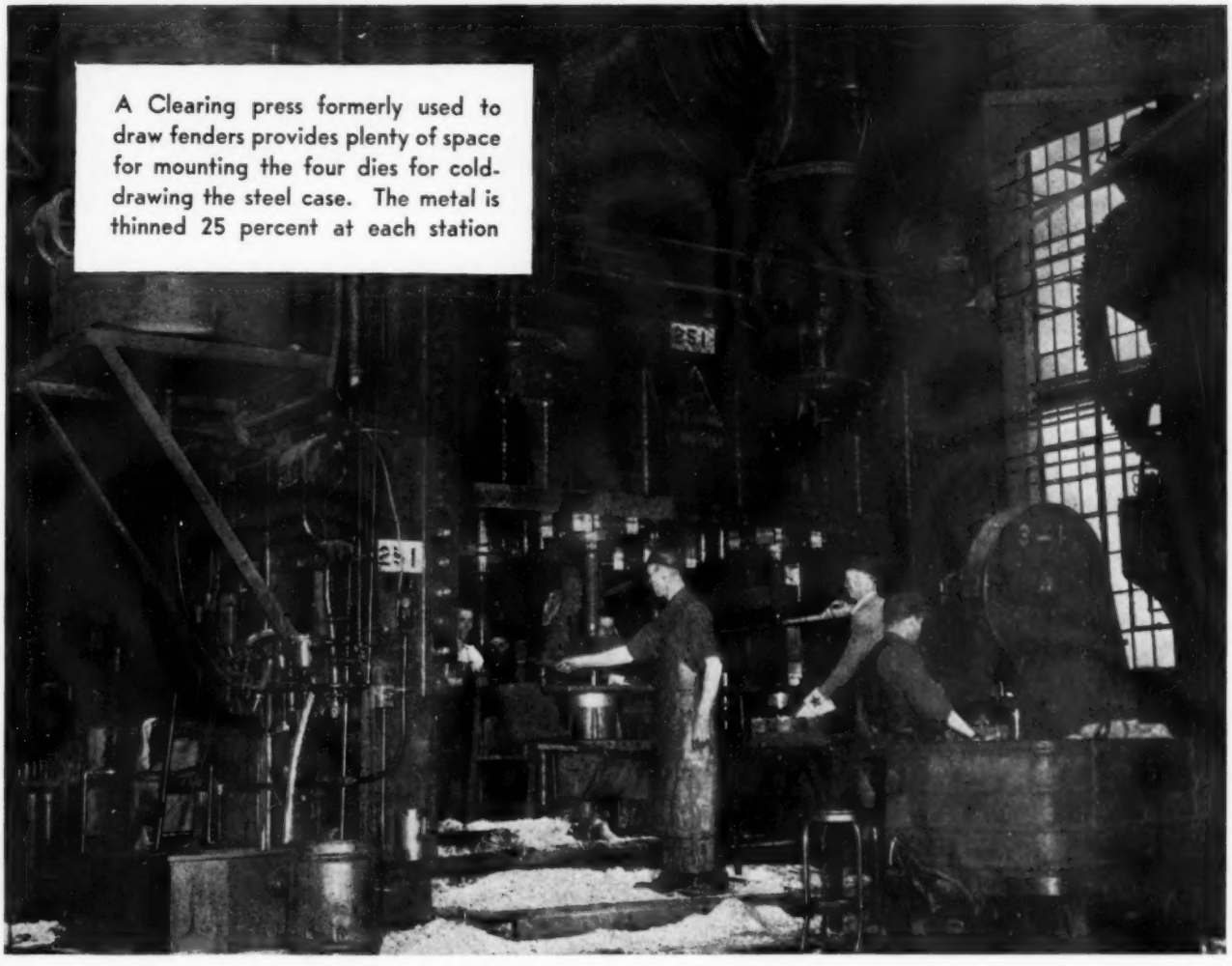


Fig. 5—Cold shuts are avoided in heading by the manner in which the metal is displaced. At the first die station, the convex punch moves the metal sideways instead of forcing it down into the wall and disturbing the grain flow. The second station completes the flange



A Clearing press formerly used to draw fenders provides plenty of space for mounting the four dies for cold-drawing the steel case. The metal is thinned 25 percent at each station

gallons of Standard Oil (Indiana) No. 6214 forging grease, and ten gallons of lard oil. Sulphur is not used.

Before cold heading the Bonderite coating is renewed, because it has been either lost or drawn out to extreme thinness in the cold drawing operations. An indexing die, mounted on a slide, is employed for the heading operation. At the first station a convex punch surface spanks the metal at the center of the head and throws the metal in the legs outward instead of forcing it down into the wall of the case. At the second station, the punch flattens and finish forms the head, and to some extent finishes the primer indent. These two operations avoid folds in the metal when forming the flange. Stripping is done at the third station.

Annealing before tapering is a critical operation. It is limited to a depth of 2 in. to prevent splits during tapering and sizing the neck on two dies set up in one press. Annealing temperature is closely controlled. The cases are mounted on a conveyor and moved between two rows of radiant gas burners mounted horizontally in the furnace. The cases are rotated slowly as they move past the burners.

In tapering and sizing the neck of the case, cold steel must be made to flow into the desired form without wrinkling or distortion, and without the support of a punch on the inside. The case is simply forced up into a tapered die cavity in two stages, both on the same press. The second stage does have a punch that extends 3½ in. into the case, not for the overall taper but to support the metal in forming the reduced section at the mouth.

After the tapering operations, the mouth end becomes appreciably harder because of cold working, so it is annealed once more to a depth of 3½ in. from the open end. This softens the mouth and assures a tight seal in the breech chamber to prevent the explosion from blowing back.

This sequence of operations produces a cartridge case with high physical properties in the head and the side wall, except for the annealed mouth. The machining of the head is complicated by the fact that the flange is very hard whereas the center is softer, conditions which are just the opposite of those desirable when spindle speed is fixed. Single-spindle and multiple-spindle automatics from car-production days did not possess accelerating spindles. Carbide tools faced the hard rim satisfactorily but the cutting speed at the center was so reduced that the tools dug in. Furthermore with carbide tools, breakage arose from the fact that there are difficulties in chucking the case on old equipment to overcome the run-out occasioned by the fact that two tapers are really pro-

duced on the case. One taper runs back about 1½ in. from the head, the second to the mouth of the case, and it is difficult to blend these tapers in die practice.

High-speed steel tools could not be run fast enough for satisfactory production, because they started to cut on the hard rim.

A compromise was reached by using Stellite J-Metal tools cutting at 250 surface ft. per min. on the outside of the case. Pieces per grind with these tools are as follows: Rough forming tool for flange, 700 pieces per grind; facing tool, 700 pieces per grind, and finish form tool, 2000 pieces per grind.

With new automatics now being tooled up for this operation, it is expected that much higher production can be reached, particularly through the hope that accelerating spindles will prove feasible for this size of chucking work. These machines are considered capable of completely machining the head at the rate of 150 pieces per hour.

In current practice, the primer hole, drilled on the automatics, is counterbored and reamed in two stages on two-spindle drill presses. Rough and finish operations are required for counterboring, because it was found that with one operation the tool would cut too deep and load.

A final stress relieving or drawing operation in Lindberg batch-type furnaces adds approximately 10,000 lb. per sq. in. to the yield point of the shell case material. Each furnace accommodates 316 cases to a charge.

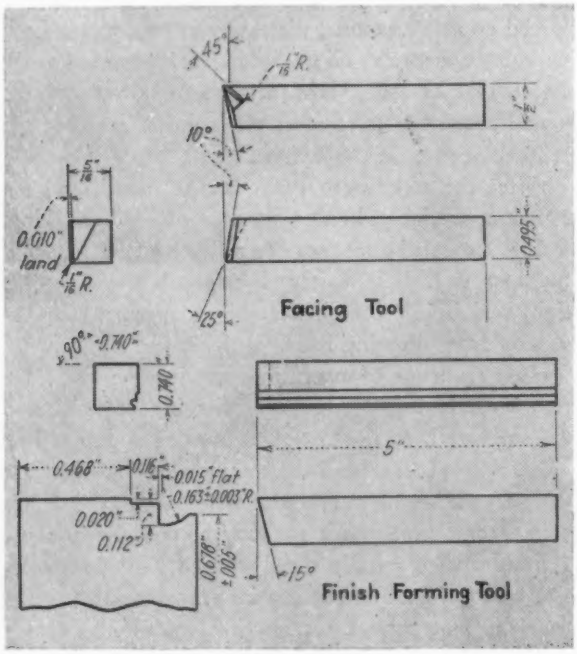


Fig. 6—Stellite J-Metal tools cutting at 250 ft. per min. at the rim represent the optimum tool material because the flange on the head is extremely hard while the center of the head is soft enough to permit carbide tools to dig in

Cartridge cases have now reached the stage where they have passed inspection for dimensions and defects and possess the finally desired physical properties. Retention of quality until use is obtained by application of an unpigmented baked phenolic varnish to provide protection against corrosion and sparking. Cleaning before spray painting is an important sequence of operations.

Etching Gives Better Varnish Bond

The stress-relieved shell cases are dipped in 5 percent sulphuric acid to remove oxide. Rinsing follows. Rusting before painting is inhibited by dipping the cases in a two percent "Sol Klean" solution maintained at 170 F., by which means a very slight phosphate coating is formed on the metal. It is considered that the second Bonderite coating has lost its efficacy. The Sol Klean treatment is also believed to give a somewhat better bond for the varnish as a result of etching by phosphoric acid, as well as some service protection. Cases coming from the Sol Klean tank are rinsed and then air dried in an oven. A light deposit of loose oxides or sludge appears to be a consequence of phosphoric-acid treatments, and it must be removed by wiping before spray painting. Cloth wheels clean the interior of the cases.

Spray painting, baking and cooling are continuous processes linked by a conveyor. Shell cases are placed on conveyor spindles and moved first past the DeVilbiss automatic spray painting machine. Two spray-head arms move vertically on a column in this machine. One head enters the shell-case cavity to spray the interior, while the second moves in a vertical path to coat the exterior. Film thickness must not exceed 0.0005 in., and is held between 0.0003–0.0004 in. Total variation in film thickness from top to bottom must not exceed 0.0002 in. The work spindle is rotated as the sprays operate in order to equalize the film thickness.

Once coated the cases make three loops through three banks of infra-red lamps that bake the finish in 24 min. A peak temperature of 380 F. is reached in the head, as determined by the thermo-couple test. Cases are rotated to assure even drying, and vapors are exhausted. When the cases emerge from the oven, the conveyor carries them back and forth under an exhaust cooling hood, where they are quickly cooled to a safe handling temperature for inspection.

The Buick process for the production of steel cartridge cases has been made available to the government for use by other manufacturers without license and is now being employed in the production of other sizes than the 75-mm. made at Flint.

TIME-DATA SHEET NO. 50

Radial Drill Press Operations—XV

(Continued from Time-Data Sheet No. 49)

SYNTHESIS—EACH PIECE TIME:

Open and close hinged jig cover:
$W = 0.0010 = 1.04\ (V_4 + H_5) = 1.04\ (0.0005 + 0.0005)$.

Place and remove jig cover when not hinged:
$X = 0.0030 = 1.04\ (R_5) = 1.04\ (0.0029)$.

Place, remove and adjust very large jig cover with jib crane:
$Y = 0.1010 = 1.04\ (W_4 + J_5) = 1.04\ (0.0623 + 0.0352)$.

Place and remove conjunction part of jig:
$Z = 0.0285 = 1.04\ (X_4 + K_5) = 1.04\ (0.0098 + 0.0176)$.

Tighten and release locating screw by hand:
$A_1 = 0.0033 = 1.04\ (A_5 + S_5) = 1.04\ (0.0023 + 0.0009)$.

Tighten and release locating screw with wrench:
$B_1 = 0.0055 = 1.04\ (B_5 + T_5) = 1.04\ (0.0035 + 0.0018)$.

Tighten and release thumb screw or wing nut:
$C_1 = 0.0013 = 1.04\ (Z_4 + U_5) = 1.04\ (0.0008 + 0.0005)$.

Tighten and release hexagon or square nut with wrench:
$D_1 = 0.0035 = 1.04\ (V_5) = 1.04\ (0.0034)$.

Insert and remove locating pin in jig:
$E_1 = 0.0048 = 1.04\ (D_5) = 1.04\ (0.0046)$.

Turn up trunnion jig one half turn:
$H_1 = 0.0415 = 1.04\ (F_5) = 1.04\ (0.0400)$.

Turn trunnion jig completely over:
$J_1 = 0.192 = 1.04\ (G_5) = 1.04\ (0.0184)$.

Constant for small part in vise:
$0.0093 = 1.04\ (C_6 + D_6 + H_6 + J_6 + K_6 + P_6) = 1.04\ (0.0020 + 0.0015 + 0.0019 + 0.0012 + 0.0012 + 0.0011)$.

Constant for medium part in vise:
$0.0119 = 1.04\ (C_6 + E_6 + H_6 + J_6 + K_6 + Q_6) = 1.04\ (0.0020 + 0.0029 + 0.0019 + 0.0012 + 0.0012 + 0.0022)$.

Constant for large part in vise:
$0.0149 = 1.04\ (C_6 + F_6 + H_6 + J_6 + K_6 + R_6) = 1.04\ (0.0020 + 0.0044 + 0.0019 + 0.0012 + 0.0012 + 0.0036)$.

Constant for turning small part in vise:
$U_1 = 0.0081 = 1.04\ (K_6 + C_6 + L_6 + H_6 + J_6) = 1.04\ (0.0012 + 0.0020 + 0.0015 + 0.0019 + 0.0012)$.

Constant for turning medium part in vise:
$U_1 = 0.0093 = 1.04\ (K_6 + C_6 + M_6 + H_6 + J_6) = 1.04\ (0.0012 + 0.0020 + 0.0024 + 0.0019 + 0.0012)$.

Constant for turning large part in vise:
$U_1 = 0.0105 = 1.04\ (K_6 + C_6 + N_6 + H_6 + J_6) = 1.04\ (0.0012 + 0.0020 + 0.0038 + 0.0019 + 0.0012)$.

Line up part in vise with scale or level:
$T_1 = 0.0042 = 1.04\ (G_6) = 1.04\ (0.0040)$.

Constant for handling small part on table:
$0.0058 = 1.04\ (S_6 + T_6 + X_7) = 1.04\ (0.0030 + 0.0015 + 0.0011)$.

Constant for handling medium part on table:
$0.0084 = 1.04\ (S_6 + U_6 + Y_7) = 1.04\ (0.0030 + 0.0029 + 0.0022)$.

Constant for handling large part on table:
$0.0110 = 1.04\ (S_6 + V_6 + Z_7) = 1.04\ (0.0030 + 0.0044 + 0.0036)$.

Constant for handling very large part on table by hand:
$0.0153 = 1.04\ (S_6 + W_6 + A_8) = 1.04\ (0.0030 + 0.0064 + +0.0053)$.

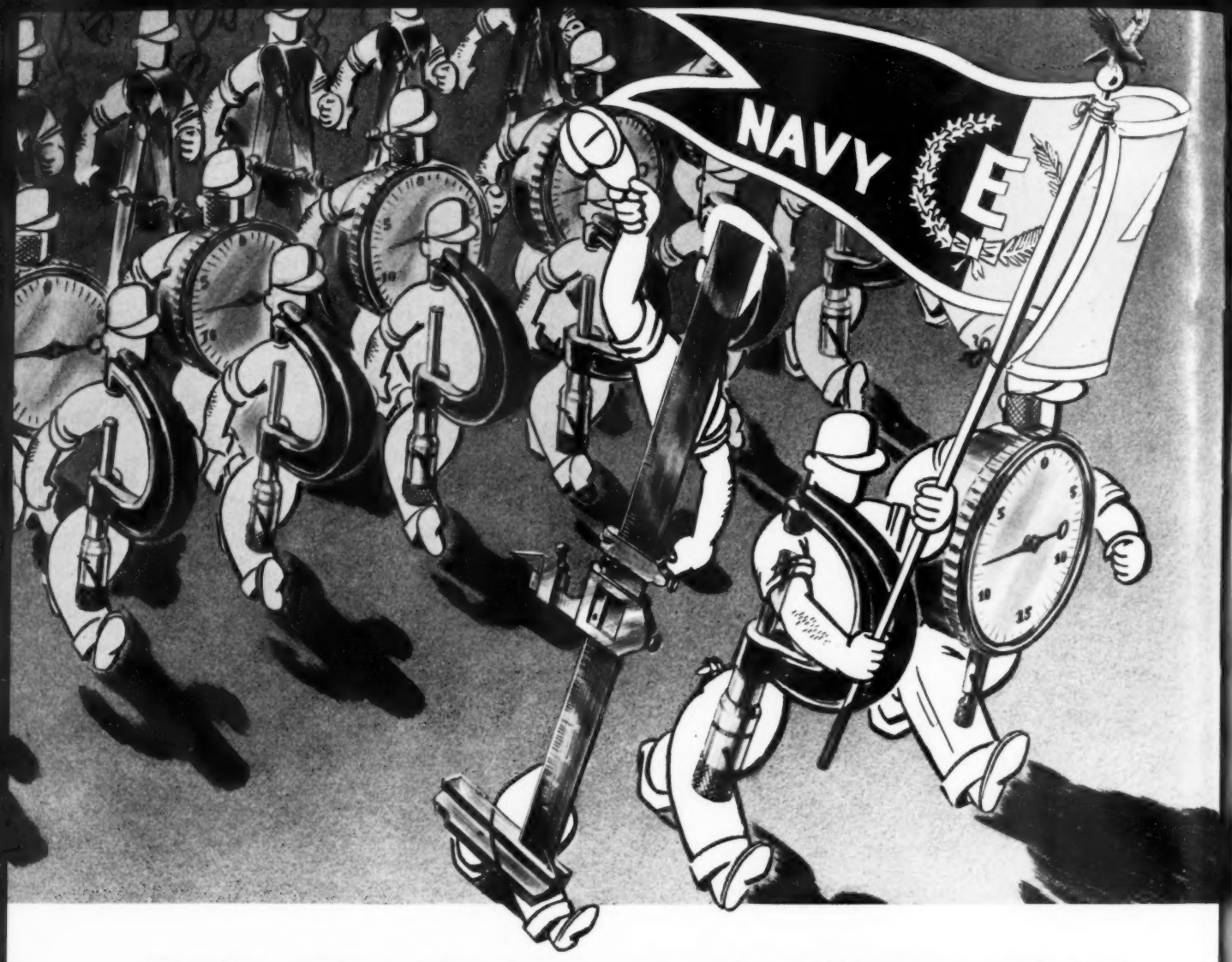
Constant for handling very large part on table with jib crane:
$0.0722 = 1.04\ (S_6 + X_6 + Q_3 + T_3 + B_8) = 1.04\ (0.0030 + 0.0352 + 0.0062 + 0.0028 + 0.0270)$.

Constant for handling part on table with over-head crane:
$0.1230 = 1.04\ (S_6 + Y_6 + Q_3 + T_3 + W_7 + C_8) = 1.04\ (0.0030 + 0.0450 + 0.0062 + 0.0028 + 0.0451 + 0.0165)$.

(Continued on Time-Data Sheet No. 51)

Table No. 15—Time to Counterbore Various Materials

Dia. of C'Bore.	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 3/4	2	2 1/4	2 1/2	2 3/4	3 1/4	3 7/8
Cast Steel (65 ft. per min.)													
R.P.M.	330	285	248	221	199	152	142	124	111	100	90	76	64
Feed per rev.	0.012	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.012	0.012	0.012
Time per inch	0.0048	0.0045	0.0051	0.0058	0.0064	0.0084	0.0090	0.0103	0.0115	0.0127	0.0177	0.0209	0.0249
Cold or Hot Rolled Steel (80 ft. per min.)													
R.P.M.	408	349	306	272	245	188	175	153	136	122	111	94	79
Feed per rev.	0.012	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.012	0.012	0.012
Time per inch	0.0039	0.0036	0.0042	0.0047	0.0052	0.0068	0.0073	0.0083	0.0094	0.0104	0.0144	0.0169	0.0202
Bronze Alloys (90 ft. per min.)													
R.P.M.	458	393	344	306	275	212	196	172	153	138	125	105	89
Feed per rev.	0.012	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Time per inch	0.0035	0.0032	0.0037	0.0042	0.0046	0.0060	0.0065	0.0074	0.0083	0.0092	0.0102	0.0121	0.0143
Copper (180 ft. per min.)													
R.P.M.	917	787	688	612	550	423	392	344	306	275	250	211	177
Feed per rev.	0.012	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Time per inch	0.0017	0.0016	0.0019	0.0021	0.0023	0.0030	0.0033	0.0037	0.0042	0.0046	0.0051	0.0060	0.0072
Brass Alloys (130 ft. per min.)													
R.P.M.	661	569	497	442	398	304	283	248	221	199	181	152	128
Feed per rev.	0.012	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Time per inch	0.0024	0.0022	0.0026	0.0029	0.0032	0.0042	0.0045	0.0051	0.0058	0.0064	0.0070	0.0084	0.0100
Cast Iron (100 ft. per min.)													
R.P.M.	509	437	382	340	306	235	218	191	170	153	139	118	99
Feed per rev.	0.015	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019
Time per inch	0.0025	0.0023	0.0026	0.0030	0.0033	0.0043	0.0046	0.0053	0.0059	0.0066	0.0072	0.0085	0.0102



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TIME-DATA SHEET NO. 51

Radial Drill Press Operations—XVI

(Continued from Time-Data Sheet No. 50)

Constant for turning over small part on table:
$L_1 = 0.0010 = 1.04\ (Q_7) = 1.04\ (0.0010)$.

Constant for turning over medium part on table:
$L_1 = 0.0020 = 1.04\ (R_7) = 1.04\ (0.0019)$.

Constant for turning over large part on table:
$L_1 = 0.0032 = 1.04\ (S_7) = 1.04\ (0.0031)$.

Constant for turning over very large part on table by hand:
$L_1 = 0.0046 = 1.04\ (T_7) = 1.04\ (0.0044)$.

Constant for turning over very large part on table with jib crane
$L_1 = 0.0600 = 1.04\ (Q_3 + T_3 + U_7) = 1.04\ (0.0062 + 0.0028 + 0.0490)$.

Constant for turning over very large part on table with overhead crane:
$L_1 = 0.1030 = 1.04\ (Q_3 + W_7 + V_7 + T_3) = 1.04\ (0.0062 + 0.0451 + 0.0450 + 0.0028)$.

Constant per clamp (clamp already in place):
$F_1 = 0.0061 = 1.04\ (L_7 + M_7) = 1.04\ (0.0035 + 0.0024)$.

Constant per clamp (clamp and nut put on complete):
$G_1 = 0.0120 = 1.04\ (N_7 + P_7) = 1.04\ (0.0076 + 0.0040)$.

Table No. 1 — Line up small part with surface gage:
$S_1 = 0.0094 = 1.04\ (Z_6) = 1.04\ (0.0090)$.

Table No. 1 — Line up medium part with surface gage:
$S_1 = 0.0156 = 1.04\ (A_7) = 1.04\ (0.0150)$.

Table No. 1 — Line up large part with surface gage:
$S_1 = 0.0322 = 1.04\ (B_7) = 1.04\ (0.0310)$.

Table No. 1 — Line up small part with square:
$S_1 = 0.0062 = 1.04\ (C_7) = 1.04\ (0.0060)$.

Table No. 1 — Line up medium part with square:
$S_1 = 0.0125 = 1.04\ (D_7) = 1.04\ (0.0120)$.

Table No. 1. — Line up large part with square:
$S_1 = 0.0300 = 1.04\ (E_7) = 1.04\ (0.0290)$.

Table No. 1 — Line up small part with level:
$S_1 = 0.0114 = 1.04\ (F_7) = 1.04\ (0.0110)$.

Table No. 1 — Line up medium part with level:
$S_1 = 0.0208 = 1.04\ (G_7) = 1.04\ (0.0200)$.

Table No. 1 — Line up large part with level:
$S_1 = 0.0354 = 1.04\ (H_7) = 1.04\ (0.0350)$.

Shim part (per operation):
$P_1 = 0.0084 = 1.04\ (J_7) = 1.04\ (0.0081)$.

Set jack (per jack):
$Q_1 = 0.0022 = 1.04\ (K) = 1.04\ (0.0021)$.

Adjust machine table at angle and return:
$R_1 = 0.0455 = 1.04\ (L_3) = 1.04\ (0.0438)$.

Place, locate, clamp and remove plate jig:
$M_1 = 0.0585 = 1.04\ (L_3 + M_5 + N_5 + Q_5) = 1.04\ (0.0045 + 0.0219 + 0.0200 + 0.0099)$.

Locate and spot drill from layout, per hole:
$K_1 = 0.0046 = 1.04\ (C_4) = 1.04\ (0.0044)$.

Locate and spot drill in plate jig, per hole:
$N_1 = 0.0043 = 1.04\ (P_5) = 1.04\ (0.0041)$.

INSPECTION:

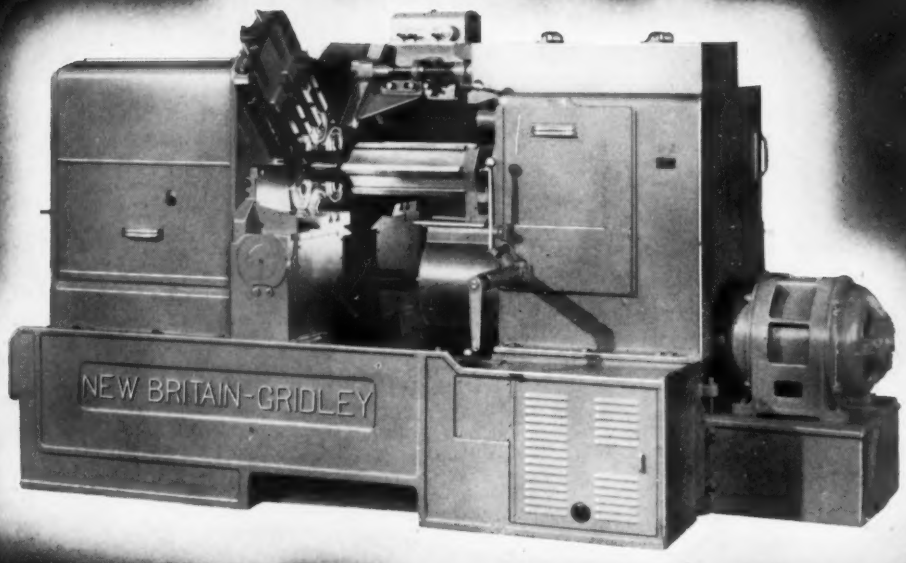
Parts must be machined as specified on the drawings and in the manufacturing information. Holes must be properly spaced and kept within the allowed tolerances.

WAGE PAYMENT:

Standard time wage payment on either group or individual incentive plan.

Table No. 16—Time to Countersink Various Materials

O.D. Csk. Hole	¼	⅜	½	⅝	¾	1	1¼	1½	2	2½	3	3½	4
Cast Steel (65 ft. per min.)													
R.P.M.	994	662	497	398	330	248	199	165	124	100	83	71	62
Time: 60°Csk.	0.0004	0.0005	0.0007	0.0011	0.0016	0.0022	0.0035	0.0051	0.0090	0.0139	0.0250	0.0309	0.0444
80°Csk.	0.0002	0.0004	0.0005	0.0008	0.0011	0.0016	0.0024	0.0035	0.0062	0.0095	0.0171	0.0212	0.0305
Cold or Hot Rolled Steel (80 ft. per min.)													
R.P.M.	1200	815	611	489	408	306	245	204	153	122	102	87	76
Time: 60°Csk.	0.0004	0.0004	0.0006	0.0000	0.0013	0.0018	0.0028	0.0041	0.0072	0.0112	0.0203	0.0278	0.0362
80°Csk.	0.0002	0.0003	0.0004	0.0006	0.0009	0.0013	0.0019	0.0028	0.0050	0.0076	0.0139	0.0190	0.0249
Bronze Alloys (90 ft. per min.)													
R.P.M.	1200	916	688	552	458	344	274	230	172	138	114	98	86
Time: 60°Csk.	0.0003	0.0004	0.0005	0.0008	0.0011	0.0017	0.0026	0.0036	0.0064	0.0101	0.0145	0.0197	0.0257
80°Csk.	0.0002	0.0003	0.0003	0.0005	0.0008	0.0011	0.0018	0.0025	0.0044	0.0069	0.0100	0.0135	0.0176
Copper (180 ft. per min.)													
R.P.M.	1200	1200	1200	1002	914	688	551	457	344	275	228	197	172
Time: 60°Csk.	0.0003	0.0003	0.0003	0.0004	0.0006	0.0008	0.0013	0.0018	0.0032	0.0051	0.0073	0.0099	0.0128
80°Csk.	0.0002	0.0002	0.0002	0.0003	0.0004	0.0006	0.0009	0.0013	0.0022	0.0035	0.0050	0.0068	0.0088
Brass Alloys (130 ft. per min.)													
R.P.M.	1200	1200	993	796	661	497	398	330	248	199	165	142	124
Time: 60°Csk.	0.0003	0.0003	0.0003	0.0005	0.0008	0.0011	0.0017	0.0025	0.0045	0.0069	0.0101	0.0137	0.0119
80°Csk.	0.0002	0.0002	0.0002	0.0004	0.0005	0.0008	0.0012	0.0018	0.0031	0.0047	0.0069	0.0094	0.0123
Cast Iron (100 ft. per min.)													
R.P.M.	1200	1018	764	612	508	382	306	254	191	153	127	109	96
Time: 60°Csk.	0.0002	0.0003	0.0005	0.0007	0.0008	0.0012	0.0018	0.0026	0.0046	0.0072	0.0104	0.0178	0.0231
80°Csk.	0.0001	0.0002	0.0003	0.0005	0.0006	0.0008	0.0012	0.0018	0.0032	0.0049	0.0071	0.0122	0.0158



My Job IN A WAR PLANT AND THE FIGHTING MAN'S JOB IN THE WAR ITSELF ARE JUST DIFFERENT ROADS ON THE SAME VICTORIOUS JOURNEY.

● **The skill and integrity of American war workers has made absolute leadership in arms possible. Let us not forget that time lost today on the production front means lives lost tomorrow on the fighting front.**

NEW BRITAIN-GRIDLEY • MACHINE DIVISION
THE NEW BRITAIN MACHINE CO. • NEW BRITAIN, CONN.

ARMY E NAVY

NEW BRITAIN AUTOMATICS

★

No Rocket Ship To Utopia

WE HEAR HIGH TALK about the postwar world. Noble hopes for full employment are being aired on all sides.

The National Planning Association is bringing together representatives of labor, industry and agriculture to work out basic principles upon which national prosperity must be based.

The National Resources Planning Board has issued a monumental document setting forth its conception of the kind of world we should live in.

The Committee for Economic Development, under the able guidance of Paul Hoffman, is doing a grand job of studying after-war problems.

Labor unions are becoming vocal in postwar discussions. Scores of other organizations, some with broad and others with narrow interests, are delving into the magic subject.

It will be free enterprise's last chance, warn most observers, to show what it can do to provide jobs for everybody; and heaven help it if it doesn't produce the jobs.

All of this is very well, as far as it goes. What is needed from here on is not pious talk, but action. Fine resolutions alone will get us nowhere.

The only way that private enterprise can step up to its after-war responsibility with hope of success is for each and every manufacturer to get busy laying as definite plans as possible now. To be satisfied with leaving the job to others is to invite disaster. The best-laid programs of national groups will mean less than nothing unless each individual company does its part.

Our first and immediate task is to win the war. But no longer does the government or the public think it inappropriate or undesirable for a manufacturer to give quiet study to the gigantic and inescapable problem of providing work when the conflict ends.

If any manufacturer expects to come up to armistice day with anything beyond a prayer for the future he must do more than support collective action for postwar. He must make after-war planning a part of his organization's day-by-day activities.

He must do some sweating over prospective markets after V-day, he must develop new products and new processes which will aid mass production of goods at lower prices and he must be prepared to redesign his products to take advantage of new and improved materials as they appear.

He may wish to diversify his lines. He may want to shift emphasis from heavy goods to consumer goods, or the other way round. He has the opportunity to investigate and conduct research in new products rapidly coming to the front.

Such operations are not for big companies alone. We know of a firm employing 600 men which has a well equipped research and development laboratory now dipping into two new products for postwar purposes.

The point is that the best way for any metal-working company to do its share to insure full peacetime employment is to start the spade work now. Plenty of dirt must be turned over, properly screened and the seeds planted. All of us who have victory gardens know what a job that is. It requires plenty of perspiration as well as inspiration.

In postwar planning or in anything else, we must realize that there is no rocket ship to Utopia.

Burnham Finney

GAGING BUSINESS

Shift from machine tool manufacture continues, but output sticks near peak. Exports are large and expected to continue. Many plants can produce more than services order. Civilian economy seen as an adjunct to war production

Builders Shift To Components More and more machine tool builders are getting into the production of war goods other than machine tools. As their own machine tool production volume gradually shrinks, they are filling up the gap with vital goods badly needed in the war effort. Many of them are turning to aviation and ship parts, because shortages there are more critical than elsewhere. In addition to this new phase of their operations, machine tool builders are beginning to release large subcontractors who have manufactured complete machines for them. Such a procedure will permit these companies to take on other war work.

The reduction in machine tool orders, which indicates that most of the new tooling for the war program has already been placed, has not yet seriously affected production. As a matter of record, output is staying up close to the all-time high, and some companies report that shipments are at a new peak. Since the machines now on order are required as quickly as possible by the Army and Navy, the pressure upon machine tool builders to make deliveries has not eased much. In many places the drafting of workers and the shortage of new help is putting upon management the major task of preventing shop efficiency from dropping off.

Russian Tool Demand Is Big Russia is asking for large quantities of machine tools. The demand from the Soviet Union is expected to remain high during the rest of the war and in the years immediately following the war. The job of rebuilding war-destroyed plants and of developing new factories in the further industrialization of Russia will mean hundreds of millions of dollars of machine tool business for American builders in the next five years. England also is seeking a considerable volume of machine tools here, but not so many as earlier in the war.

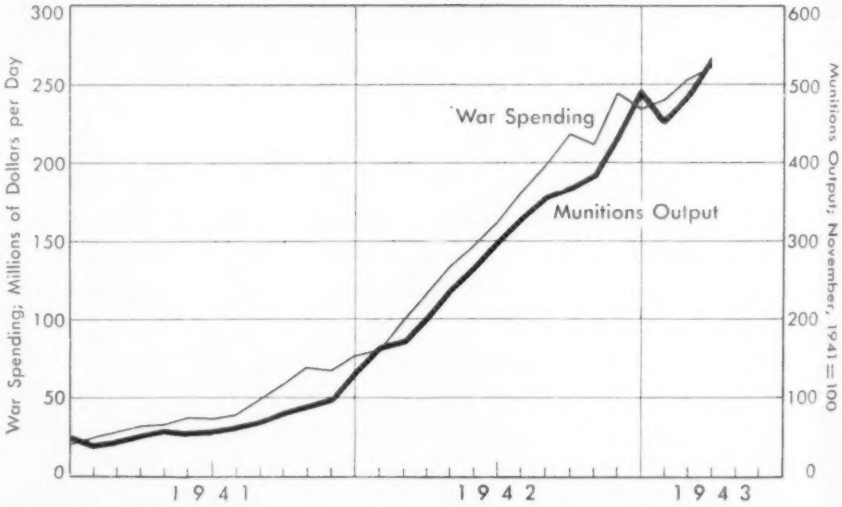
Thinking about the possibility of after-the-war markets, machine tool companies are quietly exploring Latin America, particularly Mexico. It is uncertain at this time how much machine tool business can be secured in the countries south of here, though it appears limited because of the poor prospects for mass production industries being established in most countries in the near future. Further development of transportation, road construction and mining will come first.

Capacity Exceeds Orders War production in the country's metalworking plants is spurting ahead. Plane output is rolling along at a rapid rate, and a high government official predicts that this year's assemblies will exceed 100,000 units. Ordnance plants are running at varying rates, some being far below projected schedules because of cutbacks ordered by the Army. One plant making a heavy ordnance item, for instance, is operating at only 60 to 70 percent of its originally scheduled output for May. Another factory, tooled to make 600 units a month of a specified item, has never turned out more than 350 a month because the Army has never ordered more than that number for delivery in such a period.

Arms' Cuts Don't Ease Materials A widespread impression that materials will immediately be easier as a result of the cutbacks in armament production is unfortunate. The situation in some materials, notably steel plate, is tighter than it has been at any time. With the step-up in merchant shipbuilding that has been decided upon and with heavier demands from other sources, notably railway rolling stock, steel plate production capacity will be engaged to its limit indefinitely.

War Needs Pace Civilian Wants Shifts in emphasis on what may be manufactured for civilians has added to the growing conviction that there will be much more for the civilian economy this year. The resumption of farm equipment manufacturing on a large scale has given strength to this conviction. Likewise the reconversion of one of the first builders of tanks to locomotives has been interpreted as an indication of what to expect. But these and other similar moves merely reflect recognition of the necessity for maintaining those phases of the civilian economy required to keep the country's war efforts at the peak. It is believed possible that before the end of the year a small amount of materials will be released for development work in connection with the manufacture of postwar products.

WAR SPENDING AND MUNITIONS OUTPUT



Emphasis on Munitions—The rate of output of munitions continues to rise as effort is diverted from construction to direct armament. War spending, which includes munitions, construction, pay subsistence and agricultural lend-lease, attained $7,112,000,000 for March, somewhat easing its climb as camps and production facilities are completed; peak of construction was in August. Rate of munitions output in March was 482, or nearly five times that for pre-Pearl Harbor-November. Donald Nelson has announced that the first quarter of 1943 saw but 18 percent of the year's bogey reached. To meet his program, output will have to be stepped-up 50 percent during the other three quarters

WPB Withholds Contracts from Labor Shortage Areas

Production areas are classified by labor supply available, and contracts may not even be renewed where shortages exist. Awards are made where labor supply isn't critical

By ROBERT COLBORN

WASHINGTON, D. C.—Dozens of manufacturers in Cincinnati were asked last month to take contracts for propeller parts because Vandalia, Ohio, where General Motors' Aeroproducts Division had been making the propellers, is located in a labor shortage area. It was one example of the results of a procurement policy initiated by WPB last October and now in full effect. A WPB directive of October 10 ordered the procurement agencies to place contracts—after ensuring that delivery dates would be met and that new facilities would not be required—in those areas where labor is plentiful.

To put the policy into effect, the War Manpower Commission started last December to classify areas of the country according to their labor-market situation. They are now divided into four groups. In Group I are areas of acute labor shortage where it is forbidden to place new contracts or even to renew existing contracts. Group II areas are those in which a labor shortage is anticipated within six months. In these areas, existing contracts may be renewed, but no new ones may be placed. Groups II and IV are areas, respectively, in which labor shortage is either six months away or nowhere in sight.

The armed forces have incorporated the rules in their own instructions to procurement officers. Any officer who places a contract in a labor shortage area must make a report to Washington certifying that he could not place the contract elsewhere without providing new facilities.

A sampling survey made when the program was just beginning to become effective showed that last December the percentage of contracts placed in Group I areas had been cut to 11.7 percent, as compared with 30.8 percent in the previous August and September. Correspondingly, 70 percent of the contracts went into areas in Group III or IV or unclassified, as compared with 17 percent in the earlier period.

Appeal Court Set Up

WPB's own activities in connection with the policy are almost entirely devoted to making exceptions. WPB's Procurement Policy Board has set up a Critical Labor Area Appeals Board to pass on the appeals of firms in shortage areas who feel they should still be allowed to take contracts. The board is pretty tough about granting exemptions. The sort of case in which an exemption is granted most frequently involves a firm which has initiated the production of some item, helped other firms elsewhere to get into production, and then finds that the labor-supply policy throws all the business into the firms it has nursed along and leaves it high and dry.

Body to Oversee Transfer Of Idle Tools Is Proposed

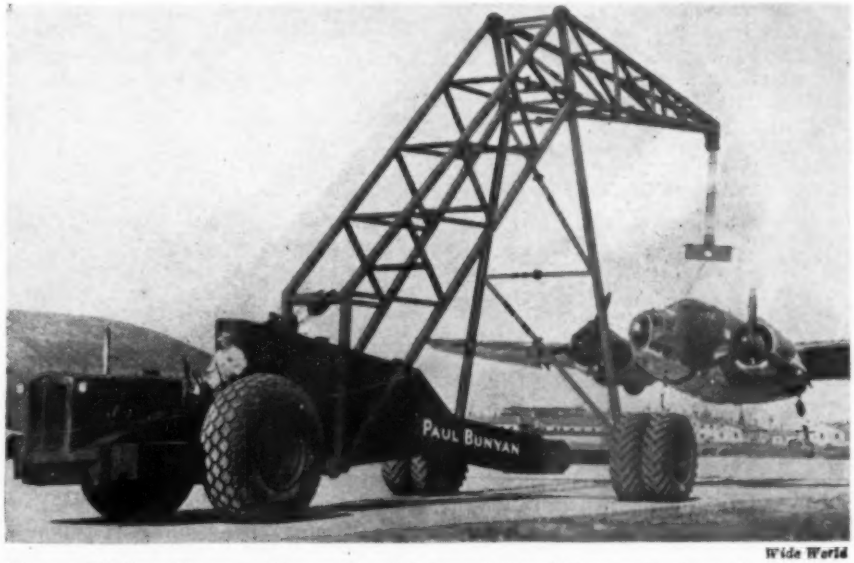
WASHINGTON, D. C.—Increasing numbers of machine tools, hand tools, and various machines are becoming idle in manufacturing plants due to changes in product design, completion of war contracts, and in some cases over-buying on the part of the manufacturer. These points were made at a meeting the other day of Industrial Supply Distributors Advisory Committee. The members proposed to set up machinery whereby these tools can be redirected into plants which have immediate need for them.

Inquiry by AMERICAN MACHINIST revealed that the committee had not checked with the tools division of the War Production Board. The tool division long ago set up an available tools section for redistribution of idle equipment.

Okay Intra-Industry Shift Of Air Parts and Materials

WASHINGTON, D. C.—WPB directive No. 16 authorizes the aircraft scheduling unit at Wright Field to approve the transfer of materials and parts from one aircraft manufacturer to another. On its face, the order seems to do no more than condone a practice which has been going on for more than a year, especially among the members of the West Coast Aircraft War Production Council. These firms made the transfers as needed, and the district officers of Army and Navy came along later and arranged the priorities and inventories and other bookkeeping. It was illegal but it was honest and everybody concerned regarded the practice as beneficial to the war effort.

But behind the directive is more than mere condonement of an accepted practice. The War Production Board is daily putting on more pressure for efficient use of machines, men and materials throughout all war industries. The Board is devising ways of taking these ingredients away from inefficient plants and giving them to producers who can deliver. This directive is one of those devices; there are others; there will be more. At first thought you might think it would be easier to prevent delivery of materials and machines to inefficient plants. But if the Board does that, then the producer says: "How can I produce when my supplies are shut off?" If he gets everything he needs, and then doesn't produce, he has no comeback.



Wide World

Plane Picker-Upper—Recently christened "Paul Bunyan" after the mighty legendary woodsman, this crane on wheels is used in an Army Air Depot near Spokane, Washington, to expedite handling and repairs to big airplanes

Management Conference Deals With Manpower and Materials

CLEVELAND, OHIO—Wartime manpower was the theme of the American Management Association Production Conference held May 5 and 6 at the Hotel Statler. Taking its keynote from a Truman Committee statement that the principal means of alleviating the labor shortage is by "increasing the productivity of our present labor force," the conference developed ways and means to implement this conclusion.

A high point in the sessions was the discussion of the incentive compensation in wartime. H. E. Riley, chief, Administrative Research Section, National War Labor Board, presented the Washington viewpoint. Industry's spokesman on the subject was W. R. Wilson, The Murray Corporation of America. Mr. Wilson stressed the need for union - management cooperation in developing production standards. George Trundle, Jr., president, Trundle Engineering Co., was chairman at this session.

GEORGE TRUNDLE

Some Problems Contradictory

Present-day production problems were reviewed by L. C. Morrow, editor, *Factory Management and Maintenance*, in opening the conference. Mr. Morrow pointed out some of the contradictions in the current situation, such as unemployment in the midst of a manpower shortage.

The War Manpower Commission has recently set up a Bureau of Manpower Utilization. Frank H. Sparks, director, explained the Bureau's functioning in the first statement on this subject given to production executives.

Materials Control Plan

Closely related to the question of manpower is that of material supply. At a luncheon meeting Harold Boeschenstein, director, Production Controls Bureau, War Production Board, reviewed experiences with the Controlled Materials Plan and gave an indication of the future program.

The detailed operation of the plan was explained by CMP Director Walter Skuce. E. N. Osterberg, purchasing agent, Stewart-Warner Corporation told how an industrial procurement department worked with the WPB in making the CMP effective. The speakers were followed by a panel discussion. Making up the panel were the speakers themselves, Mr. Morrow, Kenneth Anderson, executive assistant to the War Projects Committee, National Electrical Manufacturers Association, and M. R. Blish, production manager, Dictophone Corporation.

Better Scheduling Described

Practical means of making better use of available manpower was the general subject of a series of talks on the second day of the meeting. James G. Moore, production manager, Thompson Aircraft Products Company, described a method of scheduling that greatly reduces paper work. The problem of supplying and keeping accurate account of small tools was the subject of a talk by Edwin Roth, general superintendent of the American Type Founders, Incorporated.

EDWIN ROTH

David D. Garvey, labor measurement manager, Wright Aeronautical Corporation, told how his organization had revised its time study training program to employ women, necessitating bringing this department to ten times its former size. The experiences of several companies with job relations training was described by J. J. McCarthy, who is superintendent of this type of training for the General Electric Company.

J. J. McCARTHY

Savings Through Training

R. D. Mansfield, manager standards department, Forstmann Woolen Company, told of the millions of dollars of savings resulting from the use of job methods training in war industries. The subject of manning tables, a device for supplying men by industry to the Armed Forces in an orderly manner, was covered by R. J. Greenly, acting chief, personnel division, Carnegie Illinois Steel Co.

S. E. Dyke, chief production manager, Armstrong Cork Co., outlined the way in which his organization made best use of the manpower in all of its plants by transferring its personnel from one department to another rather than by recruiting through less satisfactory new hiring process.

WORKERS' FOOD IS ASSURED

COLUMBUS, OHIO—To insure fresh, nourishing foods for employees, the Denison Engineering Co., here has begun the cultivation of 650 acres of nearby farmland. Approximately half the total acreage will be cultivated while the other half will be used for poultry raising and pasturage for sheep, cattle and swine. Needs of the company cafeteria will be supplied from the farm, and surplus products will be sold to workers' families through a company store.

Technical Librarians to Meet

NEW YORK, N. Y.—The second wartime conference of the special Libraries Association will be held at the Hotel Pennsylvania, here, June 22–24. The science-technology group, representing engineering, chemical, rubber, utilities and aeronautical libraries, will have several representative scientists as guest speakers on the program. Topics discussed will include shortcuts for finding technical information which these libraries are now so heavily called upon to produce.

Describes Development of Portable Landing Fields

PITTSBURGH, PA.—The development of steel landing mats, used widely by the Army in converting flat areas of land into airplane landing fields for all types of military aircraft, was described by G. G. Greulich, Carnegie-Illinois Steel Corp., speaking before a joint meeting of the Pittsburgh Section, American Society of Civil Engineers and the Civil Section, Engineers' Society of Western Pennsylvania, here, May 6.

Reports from military observers in Europe during 1939 indicated the necessity for some form of readily transportable surface covering or decking for airplane landing fields which could be quickly installed even when in contact with the enemy.

Studies by Carnegie-Illinois led to the invention, evolution and development of the steel plank mat, said Mr. Gruelich, engineer in the specialty division. They are solid one-piece stampings of light weight, and have integrally-formed interlocking and fastening devices along both edges which permit laying any desired width and length of runway.

The design lends itself readily to mass production; to compact nesting for bundling, handling and shipment; and to installation at the field by hand, eliminating the need for bulky equipment and complicated tools.

First produced long before Pearl Harbor there are now 29 manufacturing plants engaged in the production of the pierced plank.

INSIDE DETROIT

BY SILER FREEMAN

"Wildcat" strikes again plague Ford Rouge plant; company blames draft-age Negroes, union blames personnel policies. President's committee begins investigation. Willow Run production curve up as women offset draft and enlistment

"Wildcats" Claw Production While quiet reigns, at least temporarily, over Willow Run, a series of sporadic wildcat strikes has slashed sharply into Ford production at the Rouge plant. Quick action both by the plant management and union officials seems to have had little effect. As soon as trouble was quieted in one sector, it would break out on another.

One hundred and forty-one workers were fired by the company on May Day for leading a series of work stoppages. Officials of Local 600, UAW-CIO, announced the removal of the union chairmen in the Rouge aluminum and steel foundries, where the trouble has been concentrated. Administrators were named to conduct affairs in those two divisions until normalcy was restored.

Unrest Seems Contagious Still the unrest continued and vital production dropped. A handful started the trouble, others quit or refused to work in sympathy with them. Only last Monday 26 maintenance men started a wildcat strike which resulted in 5,484 being made idle, although the 26 went back to work 45 minutes after walking out.

A Ford representative estimated that this particular work stoppage resulted in the loss of 18,412 man hours. The previous strike cost 56,136 man hours.

Only two weeks before, three Windsor plants of Ford were tied up for three days in a dispute that kept 15,000 idle. The union charged a speedup in this case. The Canadian Ford plant is the largest producer of military vehicles for the British Empire.

The Excuses Varied A flareup over disciplinary action against three UAW members for "molesting" a plant protection officer set off the series of strikes in the Rouge plant, where vital parts for the aircraft engine and tanks are being made. Before it was settled by a negotiating committee, 1,800 other workers had joined in.

Trouble broke out anew in the aluminum foundry, where 735 workers struck over the return of an unpopular foreman. This was followed by a stoppage in the production foundry, which processes tank and aircraft engine parts. The same department was affected by the latest "wildcat" strike and 700 in the foundry machine shop suffered for lack of materials and were sent home.

Company Cites Race Trouble The stoppages at Rouge are being blamed by the company on the racial angle, which has affected so many other plants in the Detroit area. Despite the avowed intention of one top executive to have a "showdown" on the entire racial question, it has not yet come.

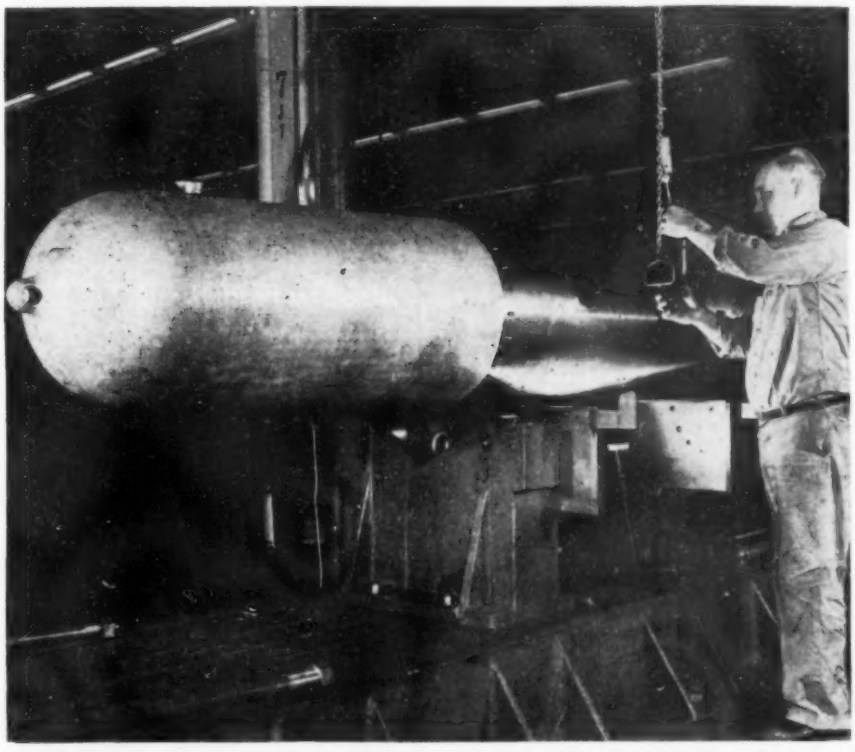
Ford officials blamed Negroes of draft age who have come into the Rouge plant because of the War Manpower Commission's "work or fight" order. One hundred and twenty-seven of the 141 workers fired for leading last week's work stoppages were Negroes of draft age. One hundred had been on the Ford pay rolls less than six months. The company charged that many fights recently in the foundries were started by young Negroes.

Union Blames Segregation Union chiefs, on the other hand, blamed "short - sighted personnel management policies." They referred chiefly to segregation of the Negroes in the Rouge plant, which caused resentment among the newer workers.

A triple investigation has been started into the work stoppages. The union is conducting one, the management another at which will be aired the local's charges against personnel policies, and a third conducted by James Fleming, examiner in charge of the Detroit office of the President's Committee on Fair Employment Practices.

Less Trouble At Willow Run Compared with Rouge, Willow Run has been angelic. With nearly 40 percent of its total employment taken by women, the production record has been a steady curve upward in the past month. The bomber plant officials are secretly pleased with the daily output and are anxious to point out to visitors that conditions in all departments have improved considerably.

The War Manpower Commission and the U. S. Employment Service are also giving themselves pats on the back for "straightening out" Willow



A Flying Fish is Born—Aircraft torpedoes, weighing nearly a ton and considered the most complex weapons in the history of warfare, are being produced by Pontiac Motor Division on an assembly line basis for the Navy. Previous torpedo production has been in the Navy's own stations

One of 1350—As the result of the manpower shortage, Brown & Sharpe Mfg. Co. now has 1350 women employed in skilled jobs, expects to have 2500 by January. To accommodate these new employees, the company has instituted a plant-wide program of changes, including adequate rest rooms and women counselors. Officials say the women are performing satisfactorily

Run. The gain in women workers has somewhat offset the losses due to enlistments and the draft. In addition, the government's serious handling of the housing problem, with new facilities rapidly coming into evidence, has helped considerably to draw new workers to the bomber plant.

Soldiers' Visit Ups Production A good "shot in the arm" was given to the B-24 production recently when 27 wounded heroes of the South Pacific were brought to Willow Run from Percy Jones Hospital, Battle Creek. The visual lesson of these soldiers, some with legs and arms amputated, arms in braces and faces on which hospital pallor vied with jungle tan, made production spurt sharply, at least for a few days after the visit, according to report of plant officials.

Army public relations officers, who accompanied the wounded men on their tour of the bomber plant, watched sharply the reaction of the workers to seeing the war brought right to their machines. They asked many casual questions, all indicating that this initial visit may become a vital weapon in spurring lagging production in other sections of the country.

War Production —Peace Dreams Better news from the fighting fronts is inspiring some of the automotive executives to day-dreaming about the post-war market. A top official of one of the "Big Three" recently revealed off-the-record that his company was keeping closer tabs than ever on its former automotive equipment which was sold and leased under the industry's program of conversion.

This company also has large amounts of machinery stored in the open in its yards. This machinery is being checked carefully at regular intervals for its state of preservation. The company's layout engineers know exactly where the machinery is going and how soon it will take to get it back from the points where they now rest. Despite the emphasis on war work, there is more than a little thought being given to the tremendous post-war market.

The only question to which they haven't an answer is "When will the war end?"

WIBEL RESIGNS FROM FORD

DETROIT, MICH.—A. M. Wibel, vice president of the Ford Motor Co. and for many years the purchasing director, has resigned. No successor has yet been named. Mr. Wibel was one of the inner counselors of the Ford organization and is widely known throughout the metal-working industries.

Mark 200th Anniversary

HIGH BRIDGE, N. J.—In commemoration of the 200th "anniversary of the making of iron and the 50th anniversary of making Hadfields manganese steel by the Taylor-Wharton Iron and Steel Company," here, that company has published a 56-page illustrated history of its origin and development. Throughout, a parallel is drawn between the growth of the company and of the nation, "from early Colonial struggles for the preservation of basic freedoms to the extended world battlefronts of today." The publication is replete with illustrations, both historical and modern, of persons, places and products related to the company's life.

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

BEARINGS — Additional controls over scheduling production and distribution of anti-friction bearings have been established to commence June 1. (Preference Order E-10.)

COPPER—Use in automotive maintenance equipment has been placed under restrictions identical with those applying to use of steel, aluminum and other critical materials. (Limitation Order L-270.)

HAND TOOLS—Production and delivery schedules may be modified by WPB under provision of Order E-6, Amended.

MACHINE AND PARTS—Regulation is closely defined to cover only open tanks, vessels and pressure vessels, with certain exceptions; to exclude outboard motors but covers fully all dies, molds and patterns unless sold in connection with a casting, or where a charge is made for it in the sale of a casting. Maximum price established for the latter includes price for die, mold or pattern. (Amendment to Order 136.)

MACHINERY—Reporting requirements for manufacturers or suppliers of machinery services operating under certain federal government developmental contracts or sub-contracts has been eliminated by OPA. (Amendment 31, MPR 136.)

METALS—To prevent confusion with CMP Regulation 5, Order P-134 has been revoked. This order assigned preference ratings for the acquisition of necessary repair and maintenance materials by producers of copper, zinc and alloys of them.

PRODUCT SYMBOLS—New set of Class B symbols replace former S-3 designation at the end of the second quarter. Persons operating under terms of CMP Regulation 5 are not permitted to use the MRO symbol for purpose of making allotments of controlled materials to others.

REPAIR PARTS—Purchase orders for certain repair and maintenance parts of general industrial equipment no longer need to be accompanied by certificates showing that they are exempted from restriction imposed. Present amendment also makes a number of changes in List A. (Limitation Order L-123 Amended.)

TOOL STEEL—Scrap has been removed from price control and specific ceiling prices have been established that consumers may pay for five types of segregated scrap as well as for unsegregated material.

VALVES—Order to reduce several types has been revised to eliminate certain specifications of physical properties of some steels. (Order L-252.)

WARTIME WASHINGTON

BY BLAINE STUBBLEFIELD

An overall war cabinet is urged for better unification of national production policy. Shipyards, accused of hoarding, were following normal inventory procedure. Shipbuilders swap materials. Navy eases steel specifications

Favor Real War Cabinet Strong sentiment is building in Washington for creation, by law or executive fiat, of a war cabinet, a super-requirements committee where war agency chiefs would get together and allocate national resources—manpower, plant facilities and such, as well as materials. Sponsors of the Pepper-Kilgore war mobilization bill are redrafting their measure to point it toward such an agency. The Truman Committee will soon bring out a report urging it.

On the executive side, war officials, such as manpower boss McNutt, whose interests go beyond material control, complain that there is nowhere that they can obtain a definite formulation of national policy; they'd welcome a real war cabinet. In WPB itself the need is felt, and the recent addition of McNutt, fuel boss Ickes, and transportation director Eastman to the WPB board is a move in that direction. The original presidential order setting up WPB probably gives it power to make itself a real war production cabinet, but it is handicapped by Donald Nelson's longtime insistence that WPB limit itself to control of materials. The new unit, which now appears inevitable, will be charged with the very job for which WPB was set up.

Surge Piles Absorb Shock Check-up on recent news reports indicates there is no unusual accumulation of plate steel in the hands of shipbuilders. Shipyards keep on hand what they call a "surge pile" of steel—meaning a reserve, so that, if a run of luck causes them to use more plate than expected, they won't have to shut down until more can be moved in. It is true that the yards have more steel on hand than they had a year ago, but in proportion to their rates of ship construction, they have far less.

The rate of building, among all Maritime Commission contractors, is now 50 days per ship on the average. The original estimate was 210 days. Later, when the preassembly system began to work, the contract estimate was cut to 105 days. Thus, the builders are shelling out ships three times as fast as they were.

Neighbors Help One Another A borrow-and-lend program is being carried on by shipbuilders, much after the manner of the airplane producers in southern California—except that it is superintended by Washington. When a builder gets ahead of schedule, his surge pile runs low. The commission either steps up his delivery schedules, or borrows some plate from a neighbor, thereby keeping production rolling.

Carbon Steel Not Critical The commission is not worried about the 18 percent carbon steel cut handed to it by the Steel Division of WPB for the third quarter. These percentages are merely estimates, and whatever war production is critical when the third quarter rolls near, will get what it needs. Carbon steel is assigned by the commission to manufacturers of engines, shafts and other machinery for merchant ships.

Bazooka Holds That Tiger The Army knew about Germany's 62-ton "Tiger" tank months in advance, and Ordnance engineers knew it could be stopped, says Maj. Gen. Levin H. Campbell, chief of ordnance. He states that the American "Bazooka" tank killer is unmatched by anything the enemy has. With the Bazooka a foot soldier can stand his ground against the heaviest tanks, he says.

Concerned Over Surplus

WASHINGTON, D. C.—One of the heaviest postwar questions (which occupy's everybody's mind despite the administration's plea that the war is no cinch) is what to do with excess plant capacity in many lines of production. In this connection, Boeing Aircraft Company states in its report to stockholders that negotiations are underway with the government for its interest in one of the Seattle plants, together with certain machinery and equipment at a price of $7,769,363. Boeing does not state its intentions with respect to its old plants.

This and That About Ordnance Adoption of 22 suggestions from employees at Picatinny Arsenal, Dover, N. J., has resulted in saving 437,500 manhours and $341,200 in operations cost.

The .45 cal. submachine gun which before the war cost $225 has been replaced by a similar but equally effective gun, produced largely from stampings and uncritical materials, and costs $21, according to a statement by William L. Batt, vice chairman of the War Production Board.

Investigators Trail Tools Over-buying of machine tools is agitating the Truman Committee. From a war production point of view, the committee's interest is belated; tool production is over the hump, has been heading downward all this year, and WPB has been rigidly sifting order backlogs in recent months. But committee investigators think they're on the track of a scandal, even though only a historical one.

Truman Charges Are Becalmed Navy's relaxation of specifications for ship plate, following admission by Carnegie-Illinois empioyees before the Truman Committee that they had falsified reports on tests, in effect puts a quietus on the whole controversy. (AM, Apr. 29, p. 116D.) The Department of Justice is still trying half-heartedly to hang criminal charges on the company. But any jury will be hard to convince, confronted with Navy's eased requirements and with the Maritime Commission's statement that it would have taken the steel, even if correct test reports had been submitted with it.

The Navy's action is intended, presumably, to halt the decline in plate production of which Donald Nelson complained. He said that the producers leaned backward following the sensational Truman Committee charges to make sure all steel met specifications, and thus slowed their output.

Wanted to Ease Specifications Actually, the Navy may have wished to befriend Carnegie-Illinois while it was eliminating an unnecessarily rigid requirement. Plate steel for the Navy is for ordinary hulls whose requirements are about the same as those built by the Maritime Commission, which says that the safety factor in standard plate steel is four or five to one.

Maritime Commission officials have considered easing their specifications but their intentions could not be learned immediately. Lend-lease steel is procured by the Commission. Before specification changes could be made, they would have to consult with the intended consignees.

ASME Head Lauds Industry's War Production Development Record

DAVENPORT, IOWA—Miracles of production by American industry to meet the needs of global warfare were described by Harold V. Coes, president, American Society of Mechanical Engineers, speaking at the annual dinner of that society, here, April 27. The dinner was the concluding feature of the two-day spring conference, devoted entirely to presentation and discussion of technical papers.

Mr. Coes spoke of the vast changes that were necessary to shift to war production. "In 1937 there were ten shipyards with 46 ways able to accommodate ships 400 ft. long or more. In 1943 there are 60 such yards with more than 300 ways: six times as many yards with 6½ times as many ways, with a capacity of 20,000,000 dead weight tons of ship construction.

Lists Production Gains

"In 1942, 750 ships were constructed, of which 570 were of the 'Liberty' type. The average time of construction was 52½ days from the time the keel was laid until the ship was launched. One yard produced 100 ships in 1942. The naval construction program for 1942 was equivalent to about 8,000,000 tons plus of merchant tonnage.

"The machine tool industry's production is seven times the prewar peacetime peak.

"The rise in munitions production in 1942 over 1941 was substantially as follows: All munitions, 4 times that of 1941; ordnance 6¼ times; merchant ships, 5 times; aircraft, 3½ times, and naval ships 2¾ times.

"By the end of 1943 we will have seven times our 1939 aluminum production, and this after 50 years of intensive development.

"Now that is no mean accomplishment." But "we must put forth still greater efforts, exercise still greater Yankee ingenuity, still more statesmanship, still more coordination and cooperation, until the ultimate goal is reached."

Lauds U. S. Air Command

America's air command outguessed the Axis by foreseeing the global character of the war and planned its air force accordingly, designing various types of planes to fit all eventualities, said Lt. Col. Nathaniel F. Silsbee, research officer of the Army Air Force group, Bureau of Public Relations, War Department, speaking at a luncheon meeting.

Under the expansion program of 1939 nine types of planes were set for production, he said, that including fighter class for ground troop cooperation, long range and high altitude fighter and three classes of bomber planes.

"The long range built into the Fortress and Liberator has saved the day in the Pacific over and over again," he pointed out.

As concerns adaptability, American planes have a decided edge over those of Axis nations. "The Italian planes have fought only in the Mediterranean area and Africa, the Japs in China and the Pacific, while American planes are fighting in Alaska and Iceland, Tunisia and New Guinea, over China, Russia and Germany.

Sees Great Air Future

"If one word had to be used in hitting off a description of American military planes, it would be 'rugged.' All classes and types have repeatedly proved their ability to take as well as give terrific punishment," concluded Colonel Silsbee.

"The airplane will contribute immensely to growth and progress in the postwar world," said W. W. Davies, research engineer, United Airlines Transport Corporation, in an address before the closing-day session.

"It will create personal and business travel, never before possible by slower conveyance; facilitate exchange of ideas by personal contact; permit better understanding of others' problems; help create a higher standard of living throughout; and stimulate community interest. This will aid in increasing trade levels, with all first-class mail, a large share of express, and a major portion of all passenger business regardless of class, using air transportation." Mr. Davies predicted the development of at least four different types of planes for airline operations in the postwar period. He envisions a four-engine 63½-ton de luxe passenger plane with a cruising speed of 266 miles an hour and a range of 2,500 miles, capable of seating 100 or sleeping 56 passengers.

George J. Huebner, a contract officer of the Smaller War Plants Corporation of the War Production Board, speaking at the manpower utilization panel, said the WPB is increasing its efforts to use small plants for war contracts, and is making progress in this line. "Those plants which still have no war work must make known their facilities and qualifications of their workers," he said, "and they should themselves confer with larger companies and with local SWPC offices."

Wartime Problems Considered by SAE Maintenance Section Group

Brig. Gen. Julian S. Hatcher and A. B. Tincher, sales manager, Kerkling & Co., discuss wartime maintenance and repairs before attending the dinner session of the two-day meeting at Hotel Pennsylvania. General Hatcher spoke on the Ordnance Field Service's activities as a link between producer and soldier. Next day, Mr. Tincher described and demonstrated the method of making repairs by cold welding

NEW YORK, N. Y.—Procedures for repairing cracked cylinder heads and blocks by the cold welding method were detailed by A. B. Tincher of Kerkling & Co., speaking before a session of the SAE National Transportation and Maintenance Meeting, here, May 5 and 6. Cold welding is a mechanical process that has been known and used in the automotive trade for years to lace together the cracked portions of the head or block by means of metal pins or rods. Interest in improved methods for carrying out the procedures are especially keen now that stocks of replacement parts are low and transportation needs high.

Lt. Col. H. O. Mathews, Ordnance Department, A.S.F., speaking at an afternoon session, described the processes of field modification of ordnance vehicles.

SPOTTING THE AIR NEWS

Prophets foresee '43 aircraft output below Nelson's aim; several factors influence total of output. Engine output exceeds airframes. Wartime experience improves airline operation. Boeing praises the .50 caliber machine gun

Just under 7,000 units was the aircraft output in April. Production in March was about 6,200, including 500 heavy bombers. The War Production Board still hopes to reach a rate of over 12,000 per month by the end of this year. Its 1943 total program is variously estimated at 90,000, 108,000, 96,000 and so on. The latest, by William Batt, vice chairman, is 100,000. You can average them up and get approximately double the production of 1942, which is the program Nelson said we were aiming at months ago. But the unofficial and "realistic" estimators, to use a favorite Washington word—the same people who prophesied we would come closer to 50,000 in 1942 than we would to the President's requested 60,000, are now guessing that we will make between 80,000 and 90,000.

Many variables throw the aircraft program this way and that. First it was machine tools, then materials, then manpower, castings and shapes, absentee workers and what not. The Services called for a shift from light planes to heavy bombers. Now there is a drift away from dive bombers, because ground AA batteries are getting too good. The newest variable is priority. For the last year or so the industry has had first position on the war program, followed by escort boats, merchant and combat ships, rubber, and high test gasoline—not necessarily in that order.

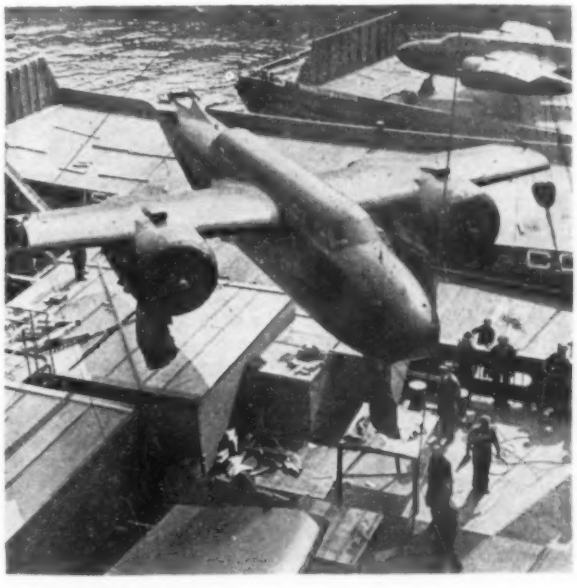
War Department says that the Rubber Director took more than his share of materials for expanding plant, leaving not enough for high test gasoline. Now, to catch up on gasoline, which is gushing into our air war at more than 50 gallons per hour per engine (combat planes averaging around two engines each) the flow of components to the aircraft factories is threatened. Some components common to the construction of gasoline plants, rubber plants, escort boats, and airplanes are valves, tubes, electric motors, instruments, antifriction bearings, and so on. The strategic programs have to be rebalanced with respect to these components. This is being made much of by press and lunch-time talkers, but both materials and components—and now manpower—are constantly being rebalanced anyway, so best to take it as arduous routine.

Steel is basic, so far as materials go, to the construction of rubber and gasoline plants. Steel is of first importance to aircraft only in the building of their engines. We are authoritatively advised now that the supply of engines is constantly ahead of the output of airframes. The Army's and Navy's hunger for spare engines is never satisfied, though. Often enough the order for spares far exceeds engine installations on a given delivery of airplanes. From an operations point of view, there will never be too many engines.

1,600 miles a day is an airline airplane's job. Before Pearl Harbor, route ships were doing 1,200 miles a day, and staying in the air about eight hours. Now they're on a 12-hour day. They do it by spending all of their spare time in service, overhaul, and maintenance shops. No official, either in the Army or in the air transport industry, has yet admitted it in public, but the war has shown operations men how to run airplanes efficiently. They are doing it so well that the Civil Aeronautics Board is cutting their passenger and mail rates.

Two new designs were completed and test flown by Boeing Aircraft during 1942, according to its report to stockholders, and a contract was negotiated for a third experimental type. This was in addition to continued development of the B-17 Flying Fortress—a term that sounds over-drawn, until you realize it has 13 fifty caliber machine guns. It can be assumed that one of the Company's developments of 1942 was the huge B-29—a Fortress with several times over of everything. "Additional research studies, market analyses and surveys are being conducted by an independent agency. These studies have been undertaken in order to better equip the management with information on which to base the important decisions that will confront the Company in the postwar future." That is one of the first public statements by an airplane company of its intent to enter other than the aircraft field, although many have talked freely about it.

The .50 caliber machine gun is described in the Boeing Company's plant magazine, Boeing News. It says the 50 is currently the darling of the Air Forces, and the Fortress is fully equipped with them. They are accurate for more than half a mile and have a maximum range of more than four miles. The firing rate is in excess of 750 shots per minute. Muzzle velocity is 1,800 m.p.h., or over 2,600 feet per second. Twenty mm. guns are also mounted on airplanes. A few carry 37 mm. cannon, which fire explosive shells, but this size fires slowly, and the airplane can carry comparatively few rounds. Firing from airplanes, with both ship and gun vibrating, is still more like squirting water from a hose than it is like sight shooting. The tracer bullets are the stream, and the gunner likes lots of them.



Lend Lease in Action — Twin engine bombers, bound for distant allied ports, are hoisted aboard ship, where expert welders fasten them securely to the deck to protect them from damage during heavy weather

OWI, Gruber

Booklet Aids Output

LOS ANGELES, CALIF.—Designed to promote the most effective use of manpower, Plomb Tool Co. has published a booklet presenting the principles of work-simplification in catchy text, illustrated with humorous pen-and-ink sketches and before-and-after photographs of actual job improvements. Entitled "These Are Your Weapons," the booklet was written primarily for Plomb employees, but its success has created a demand from other companies. In response, it is now being offered at cost—$10.00 per hundred copies—by the War Production Drive Committee, Plomb Tool Co., 2209 Santa Fe Ave., Los Angeles.

Fisher Completes New Plant For Mass Producing B-29's

CLEVELAND, OHIO—Production operations have commenced at the new Fisher aircraft plant, built by the Fisher Body Division of General Motors, for mass production of complete Boeing B-29 four-motor bombers for the Army, and fabrication of major parts and sections for other manufacturers of the same plane. The B-29 is the new big brother of the famous Flying Fortress.

The plant site comprises more than 400 acres, and the plant area is understood to approach that of Willow Run. Conceived at the time that steel had become scarce for building construction, the plant has a first and second floor fabrication area of reinforced concrete, whereas the final assembly area is built of structural steel to give sufficient height and width for assembling the B-29 in several rows.

However, completed planes will not be manufactured in appreciable quantities for a number of months, according to reliable information.

Canadian Plants Face Shift To More Vitally Needed Lines

OTTAWA, ONT.—The coming shiftover in war production will be at least as extensive in Canada as in the United States and may be more so. The outlook is that it will affect the bulk of plants engaged in war output based on metals with the exception of shipyards and aircraft factories. Principal lines of production known definitely to be involved are guns, shells, and mechanical transport. The shiftover will shut down quite a few plants for varying periods.

Principal factors compelling suspension of operations and changeovers are: (1) stockpiles of equipment sufficient to meet requirements for the next six months or more; (2) the bottleneck in ocean shipping which has left rail sidings and plant storage spaces congested; (3) need of improvement in designs of equipment based on battle experience.

As far as possible workers from suspended plants will be transferred to other war or semi-war industry until the suspension is lifted. War and non-war plants alike will undergo a new combing during June and July in a search for manpower for the Army and for essential production.

More "E" Awards Made

WASHINGTON—More plants receive Army-Navy "E" Awards for outstanding production on war work. Recipients include:

Allegheny Ludlum Steel Corp. (W. Leechburg plant), Allied Products Corp. (Plants 1, 2, 3, 4), Allis-Chalmers Mfg. Co., Alloy Steel Gear and Pinion Co., Alvey-Ferguson Co., American Blower Corp., American Foundry Equipment Co., American Gear & Mfg. Co., American Laundry Machinery Co., Baldwin Locomotive Wks., Borg-Warner Corp. Mechanics Universal Joint Div., Cincinnati Planer Co., Columbian Vise & Mfg. Co., Curtiss-Wright Corp. Propeller Div., Dahlstrom Metallic Door Co., Diamond Hill Machine Shop, Eaton Metal Products Co., Firth Sterling Steel Co., Foxboro Co.

General Electric Co. (Lynn River Wks.), General Motors Corp. (Buick Motor Div. Flint and Melrose Park plants, Chevrolet Motor Div. plants 1 and 2, Delco-Remy Div.), Gent Machine Co., Gillette Machine & Tool Co., B. F. Goodrich Co. Clarksville Div., Hall-Scott Motor Car Co., Hammond Brass Wks., Harrison Radiator Co., A. F. Holden Co., Ingram-Richardson Mfg. Co., Jeffersonville Boat & Machine Co., Lawson Machine & Tool Co., Lufkin Rule Co., Manning, Maxwell & Moore (Bridgeport and Boston), Morey Machinery Co., Pittsburgh Steel Co., Plomb Tool Co., Robbins & Myers (Springfield and Piqua, Ohio plants), Rockford Machine Tool Co., Rohr-Aircraft Corp., Rust Proofing & Metal Finishing Co., Shartle Bros. Machine Co., L. S. Starrett Co., Studebaker Corp. (Aviation Div. Chicago, Fort Wayne and South Bend), Trayor Engineering & Mfg. Co., United Steel & Wire Co., Waterbury Tool Div. Vickers Inc., Willamette Hyster Co., Wilson Mechanical Instrument Co.

For outstanding production performance the Maritime Commission's "M" award has been granted these companies:

Bethlehem-Sparrows Point Shipyard, Inc., Buckeye Iron & Brass Wks., Columbia Steel Co., Edward Valve & Mfg. Co., Ft. Pitt Steel Casting Co., Iron Fireman Mfg. Co., Jenkins Bros., Lewis Bolt & Nut Co., Marinship Corp., Mine Safety Appliance Co., Simplex Wire & Cable Co., Sun Shipbuilding & Dry Dock Co., L. Thiess & Sons Corp., Turl Iron & Car Co.

NAMES in the NEWS

W. H. Harman

William H. Harman has been named president of William Sellers & Co., Philadelphia, builders of machine tools, special machinery and locomotive injectors. Mr. Harman has been connected with Baldwin Locomotive Works since 1928, and served as vice president in charge of sales during the last five years. From 1915 to 1928 he was president of Southwark Foundry & Machine Co., now a division of Baldwin. Mr. Harman will remain a director of Baldwin Locomotive Works. He is a member of the A.S.M.E. and president of the Diesel Engine Manufacturers' Assn.

B. N. Brockman

Bernard N. Brockman has been made vice president and general sales manager of R. K. LeBlond Machine Tool Co., Cincinnati. For the past eight years Mr. Brockman has been in charge of the Chicago office. Prior to that he was connected with Federal Machinery Sales Co., LeBlond representative, for 16 years, having previously served in the manufacturing and inspection departments at the Cincinnati plant for five years. Donald Whitacre, who has been with the company for 17 years and in the Chicago office since 1935, succeeds Mr. Brockman in charge of that office.

W. O. Lippman has become manager of Westinghouse Electric & Mfg. Co., Canton Ordnance Div. For the past four years Mr. Lippman has been works manager of Westinghouse Electric Appliance Div. plant in East Springfield, Mass. He has been connected with the firm since 1918 when he joined the East Pittsburgh works.

A. D. Lewis has been named West Coast service and sales representative for Progressive Welder Co., Detroit. He has been engaged with Progressive in estimating and design engineering activities in addition to having served as shop superintendent. Mr. Lewis has been recently acting as West Coast general manager for Knu-Vise, Inc., at the Glendale, Calif., plant, which position he will continue to hold. His headquarters will be at 4328 San Fernando Rd., Glendale.

G. D. Spackman

G. Donald Spackman has been elected vice president in charge of operations of Lukens Steel Co., Coatesville, Pa., having been general manager of Lukens and its subsidiaries, By-Products Steel Corp. and Lukenweld, Inc., since 1941. In his new capacity Mr. Spackman will be responsible for the overall operations of the three companies. He joined Lukens in 1917 and has served in various capacities.

James Ballantyne has been chosen president of Philco Corp., Philadelphia. In 1934 he joined the organization as treasurer of Philco Radio & Television Corp., becoming treasurer of Philco Corp. in 1940, and was elected vice president in charge of operations in 1941. M. W. Heinritz, formerly general manager of the company's Storage Battery Div., has been named vice president in charge of the division. He became associated with Philco in 1922, having been connected with the Pittsburgh, Chicago and Philadelphia offices.

C. E. Powell has been appointed manager of the machinery department of R. D. Wood Co., Philadelphia, whose line includes hydraulic machinery, valves and presses. Mr. Powell joined the company in 1936 and has contributed numerous improvements and patents on machine and control designs during the present war production program.

Nelidoff Photo

John W. Haddock

John W. Haddock has been named president of Farrel - Birmingham Co. of Ansonia, Conn. and Buffalo, manufacturers of machinery and castings, gears and gear drives. Formerly Mr. Haddock was vice president of Sullivan Machinery Co. of Claremont, N. H., and Michigan City, Ind., makers of air compressors, contracting, industrial mining and quarrying machinery, and began his career at the Michigan City plant. Since 1938 he has been vice president in charge of engineering and sales for the company.

Robert T. V. Yohe, technical superintendent of the chemical division, B. F. Goodrich Co., Akron, Ohio, has become plant manager of the government synthetic rubber plant operated by the company in Kentucky. He succeeds J. W. Frasche who has been named plant manager at another government synthetic plant in Texas.

Wellwood E. Beall, formerly chief engineer of Boeing Aircraft Co., Seattle, has been appointed vice president in charge of engineering. He is succeeded in his former position by Edward C. Wells, who was assistant chief engineer.

Edgar N. Yost has been named division superintendent of the new armor plate plant of Carnegie-Illinois Steel Corp. which is part of the company's Gary Works. Mr. Yost has been connected with this division since 1916.

New Executive Heads of Dodge Div.

H. L. Weckler

F. J. Lamborn

Herman L. Weckler, vice president and general manager of Chrysler Corp., has been appointed president and general manager of Dodge Div. of Chrysler, succeeding W. J. O'Neil who has resigned. F. J. Lamborn, who was formerly vice president in charge of manufacturing for Dodge, has become vice president and general manager. L. L. Colbert has been advanced from operating manager of Dodge Chicago plant to general manager of that plant. J. E. Fields has retired as vice president of Chrysler Corp. but will continue to serve as a director. He has been an officer of the corporation since 1925.

Albert S. Rairden has been named sales manager of the Riehle Testing Machine Div. of American Machine and Metals, Inc., E. Moline, Ill. For the past ten years Mr. Rairden has been connected with Wickwire Spencer Steel Co. where he was in charge of sales engineering and sales of wire rope.

Frank J. Coughlin, who has been assistant purchasing agent of Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn., has been advanced to purchasing agent. Mr. Coughlin has recently completed thirty years of continuous service with the company and has been assistant purchasing agent since 1928.

Chas. A. Butcher

Charles A. Butcher, formerly assistant to the national manager of Westinghouse Electric & Mfg. Company's district manufacturing and repair department, has been appointed manager of that department for the entire Pacific Coast district. He will have charge of activities in a territory comprising all or parts of eleven western states, Alaska and the Hawaiian Islands, including the district headquarters plant at Emeryville, Calif. where he will make his headquarters. Frank H. Robb has become manager of the manufacturing and repair department for the Los Angeles area.

Robert S. Gruver has been named manager of the Ashland, Ky. division of American Rolling Mill Co. to succeed R. R. Smith who is retiring because of ill health. Mr. Gruver joined Armco in 1922, and in 1931 was sent to England as assistant manager of a steel plant operated by Armco International Corp., returning to this country in 1940. He then became assistant manager of the fabricating division, the position which he leaves to go to Ashland.

Edward G. Hardig has been appointed sales manager of National Tool Co., Cleveland. He has been sales representative in the Detroit district for eleven years.

Earl S. Patch

Earl S. Patch has been named sales manager of Henry L. Crowley & Co., West Orange, N. J., makers of the Crolite line of steatite iron cores and powdered metal parts and bearings. Formerly he was an executive of the Moraine Products Div. of General Motors Corp. in Dayton and is an authority in the powder metallurgy field. Mr. Patch will make his headquarters in the company's main office.

C. Russell Feldmann has been named president and chairman of the board at a recent meeting of stockholders of International Machine Tool Corp., including the Libby Div. at Indianapolis and the Foster Div. at Elkhart. Other appointments include Warren J. Hannum as vice president, Charles H. Foster, vice president in charge of sales; John Hancock, treasurer; H. E.

JAMES HAMMOND
New President of Cleveland Automatic Machine Co.

Hamilton, secretary and assistant treasurer; and R. L. Dillon, comptroller and assistant secretary.

Ancel St. John of St. John X-Ray Service, Long Island City, is on leave from the company to serve as senior metallurgist with the Ordnance Dept. at Washington.

BUSINESS ITEMS

American Brake Shoe and Foundry Co. has announced a change in its name to American Brake Shoe Co. The corporation was founded in 1902 as a consolidation of several foundries which had been making brake shoes for railroads. Currently the company is engaged in production of shell forgings, parts for tanks, guns, airplanes among other equipment.

Taylor Mfg. Co. of Milwaukee has purchased the plant and equipment of Wright Rubber Products Co. of Racine and will be known as the Wright Rubber Products Div. The Taylor Mfg. Co. also manufactures a line of compression mold plastics, drill presses, hydraulic dynamometers and static balancing machines.

Robins Conveying Belt Co. has adopted the shorter name of Robins Conveyors, Inc., Passaic, N. J., engineers, manufacturers and erectors of materials handling machinery.

Steacy-Schmidt Mfg. Co., York, Pa., name has been changed to Hardinge Mfg. Co. This is a subsidiary of Hardinge Co., a New York organization. As in the past, Hardinge Co., the parent company, sells specialized equipment to mining, chemical and other process industries, while Hardinge Mfg. Co., in addition to manufacturing for the parent organization, makes products to specifications and designs of other companies.

Pecker, Simpson & Gladeck, engineering and consulting firm of Philadelphia, has become associated with Langley Aviation Corp. Through this association Langley will be in a position to license manufacturers for post war use the processes and methods for manufacturing products in the plywood field.

Matam Corp. has announced the transfer of its main office from Brooklyn, N. Y. to 45-17 Pearson St., Long Island City.

Metallizing Engineering Co. has announced removal to its new home at 38-14 30th St., Long Island City, N. Y., where the entire building will be devoted to the production, experimental and research laboratories for development of the metallizing process, warehouse and executive offices.

Greene, Tweed & Co., New York City, makers of mechanical packings, hammers and reversible ratchet wrenches, has announced the appointment of J. J. McIntosh as southeastern sales representative with headquarters at 1106 McLynn Ave., Atlanta, Ga. B. F. Coombs has become Texas sales representative located at Route 12, Box 495, Houston.

Vibroscope, Inc. has moved its factory and office to 6 E. 39th St., New York City. The company manufactures the Davey vibrometers and portable balancing equipment.

OBITUARIES

J. G. Blount

J. G. Blount, 85, president and director of J. G. Blount Co., Everett, Mass., manufacturers of machine tools, passed away recently. He had been a pioneer in this industry and founded the company in 1891. Mr. Blount served his apprenticeship in various shops in Rock Island, P. Q., after which he moved to Lowell, Mass., where he was employed in the Lowell Machine Shop, working on textile machinery. Later he was employed by different firms in the machine business around Boston, and in 1883 he went into business for himself as general machinist and brass founder. Eight years later Mr. Blount formed the present company.

John B. Adt, 48, president of John B. Adt Co., Baltimore, machinery manufacturing concern, died suddenly at his home in Roland Park.

Frederick Fuller, 82, a pioneer in the development of cash registers, who was in charge of the laboratories of International Business Machines Corp. in East Orange, N. J., died following an illness of a year. He had been connected with the organization since 1925.

Michael J. Grass, 57, founder of M. J. Grass Screw Machine Products Co., Buffalo, passed away after a heart attack. He was a member of the American Society of Tool Engineers and National Screw Machinists' Assn.

Frank E. Denley, 67, vice president of McCauley Metal Products, Buffalo, sheet metal stampings, died in St. Petersburg recently.

B. W. Twyman, formerly general manager of the Nash Four plant at Milwaukee, and later manager of the Lavine Gear Co., now Ben Hur Mfg. Co., died at the age of 73.

Fred S. Denison, 56, engineering executive of Minneapolis-Honeywell Regulator Co., died in Minneapolis. He had been connected with the company for 35 years and was recently superintendent of the Lake Street Ordnance plant.

MEETINGS

American Gear Manufacturers Assn. Annual meeting. Westchester Country Club, Rye, N. Y. May 17-19.

National Metal Trades Assn. Production conference. Palmer House, Chicago, Ill. May 26-27.

American Iron and Steel Institute. Annual meeting. Waldorf - Astoria Hotel, New York, N. Y. May 27.

Society of Automotive Engineers. Diesel Engines & Fuels and Lubricants Meeting. Carter Hotel, Cleveland, O. June 2-3.

American Electroplaters' Society. Annual meeting. Hotel Statler, Buffalo, N. Y. June 7-9.

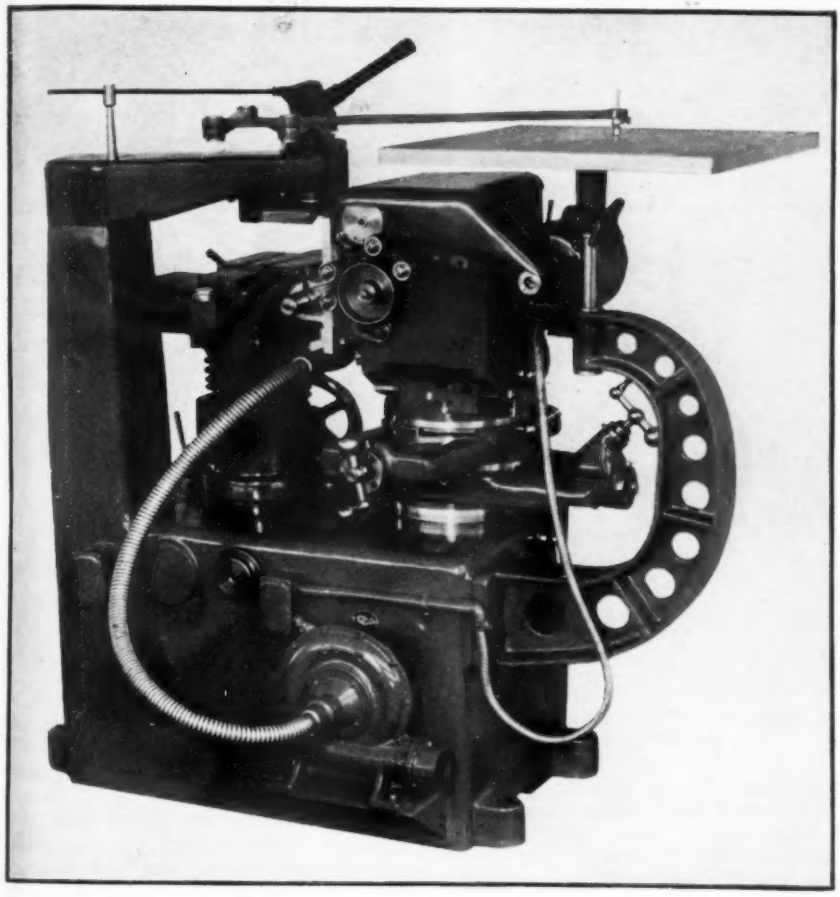
Society of Automotive Engineers. War Materiel Meeting. Book-Cadillac Hotel, Detroit, Mich. June 9-10.

American Society of Mechanical Engineers. Semi-Annual meeting. Hotel Biltmore, Los Angeles, Calif. June 14-17.

American Society for Testing Materials. Annual meeting. Hotel William Penn, Pittsburgh, Pa. June 28-July 2.

SHOP EQUIPMENT NEWS

Modern Produces Optical Profile Grinding Machine For Speeding the Production of Tools and Gages



For speeding up production of intricate profile gages, master profile form tools and similar work, Modern Tool Works, Ltd., Montcalm Ave., Toronto, Canada, has brought out an optical profile grinding machine. It is capable of grinding to an accuracy of 0.0003 in. of contour and accommodates all types of male and female contour gages up to 5½ in. in length, and will grind in one setting up to a maximum thickness of 1 5/16 in., or thin gages ⅛ in. thick in a stack of fifteen at one time. Johannson type end measuring gages are placed in the troughs of the work slides, and by their use in connection with dial indicators reading in 0.0001 in. accurate linear displacements or movements of the work slides are controlled.

The profile copying system consists principally of a pantograph having a ratio of 50 to 1. A microscope of 20 times magnification has been fitted into this pantograph system, having fine cross-hairs on a graticule plate which is adjusted to the diminishing point of the pantograph. A stylus or feeler pin is located at the long end of the pantograph arm.

In grinding the profile of a gage or form tool, a scale drawing of the profile or contour is made 50 times the actual size. This is mounted by thumb tacks on the copy table of the machine. The work to be ground is clamped on the work table, the drawing is mounted on the copy table, and the slides carrying the work are then correctly positioned relative to each other by sighting of the edge of the work piece through the microscope and comparing it with a master base line on the drawing. The work piece is lighted by upper and lower electric illumination, the upper light being white and the lower source green.

When the grinding wheel contacts the work piece at the interception of the cross-hairs, the operator moves the stylus point a short distance along the line of the master drawing, and by operating the cranks follows the same path with the grinding wheel in a series of steps. The range of work which can be ground at one checking of the work table is a square 0.375 in., which corresponds to a master drawing of 18¾ in. square. After the grinding has been done on the surface, the work-holding slides are reset to bring a new section into the grinding area.

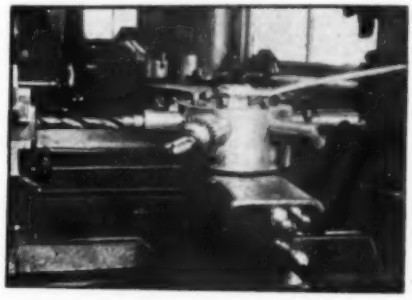
The grinding head, carrying the grinding wheel and motor, is mounted on special curved slides which allow for universal angular settings, by means of vernier degree graduations to accomplish either forward or lateral relief to form tools. These slides in turn are mounted on trunnion turntables to permit grinding of compound angles on the horizontal plane.

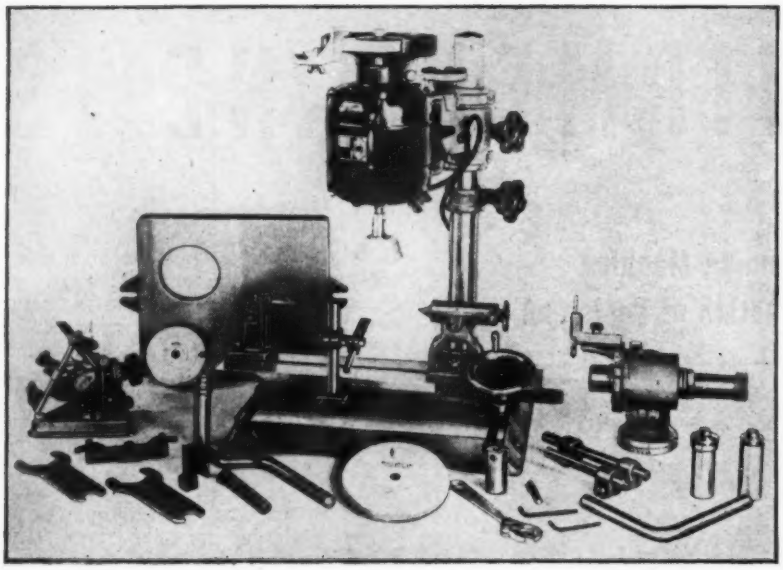
When a drawing for a complete profile covers a sheet larger than 18¾ in. square, or where the profile to be ground is longer than ⅜ in., the profile is divided up into sections.

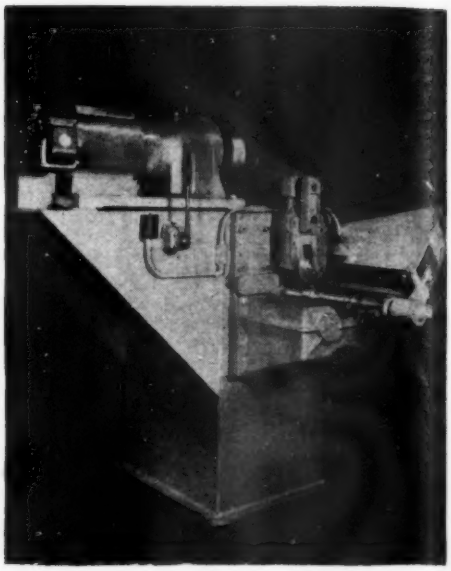
Marco Multi-Purpose Toolpost Handles Six or Eight Tools

A multi-purpose toolpost, built in two sizes to accommodate six or eight tools, is offered by Marco Co., 511 Monroe St., Wilmington, Del. This toolpost fits on the average lathe and the power feed will coordinate with the tool being used. The base is held in the lathe carriage by a clamp and is further locked in position by centering setscrews. Two holding screws in addition to the setscrews clamp the base of the tool body firmly to the carriage.

After the toolpost is set and bored for tools, one or two taper pins are provided to lock the cross-carriage in a central position. In this way, the multi-purpose toolpost can be replaced in its proper position if it becomes necessary to remove it. This equipment provides the ordinary lathe with features of a turret lathe, and makes available quickly interchangeable tools that are under the control of both hand and power feeds on the carriage.







Roan Tool and Cutter Grinder Will Handle Contour Grinding

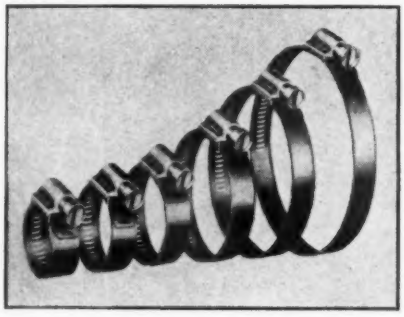
A tool and cutter grinder offered by Roan Manufacturing Co., 1225 Washington Ave., Racine, Wis., is equipped to handle the grinding of most all types of milling cutters. It can also be used for contour grinding, and being portable is a suitable bench grinder.

Graduated adjustments are provided throughout the machine. Two features of the grinder include a motor grinder head and bracket which can be raised, lowered and swiveled around, with accurate vertical adjustment assured by a vernier feed on the motor bracket. Furthermore, the motor itself can be swiveled to bring grinding wheels into any desired position.

Complete fixtures and accessories are provided to accommodate various types of tools. Among these is a precision slide which can be used independent of the grinder as a bench center for indicating and inspecting tools. An outside diameter grinding fixture is included for holding end mills and milling cutters and special form tools which cannot be held on center. This is also used for grinding the end of end mills, side cutting teeth of milling cutters, and many other facing tools of many size ranges. The grinder measures 18×16 in. at the base, and the column is 25 in. high. It is equipped with a ¼-hp. motor, 110-volt, 60-cycle a.c. The weight with all fixtures is 175 lb.

Aero-Seal Hose Clamp Is Fitted With Safety Cup

Fourteen sizes are available in the line of Aero-Seal hose clamps made by Aircraft Standard Parts Co., 1711 Nineteenth Ave., Rockford, Ill., ranging from ¾ to 4 in. inside hose diameter. The clamps consist of a 9/16 in. tempered steel band punched with holes corresponding to the teeth of a worm gear. These holes mesh with a

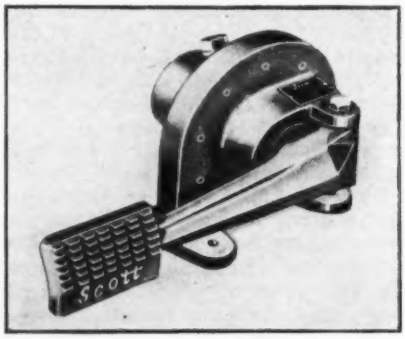


worm in the housing welded to the fixed end of the band. The screw head on the worm is fitted with a safety cup which prevents the screwdriver from slipping and puncturing the hose or damaging other equipment. This safety cup feature also makes it possible to find the slot easily in a concealed or cramped location.

The band has a total take-up of 3 in., and can be tightened considerably below its normal size by letting the free end of the band come through the housing a couple of inches. These clamps are self-locking.

Scott Brake Pressure Generator Has Pressure Up to 500 Lb.

Although developed originally for actuating wheel brakes in aircraft, the B-711 hydraulic pressure generator made by Scott Aviation Corp., Lan-



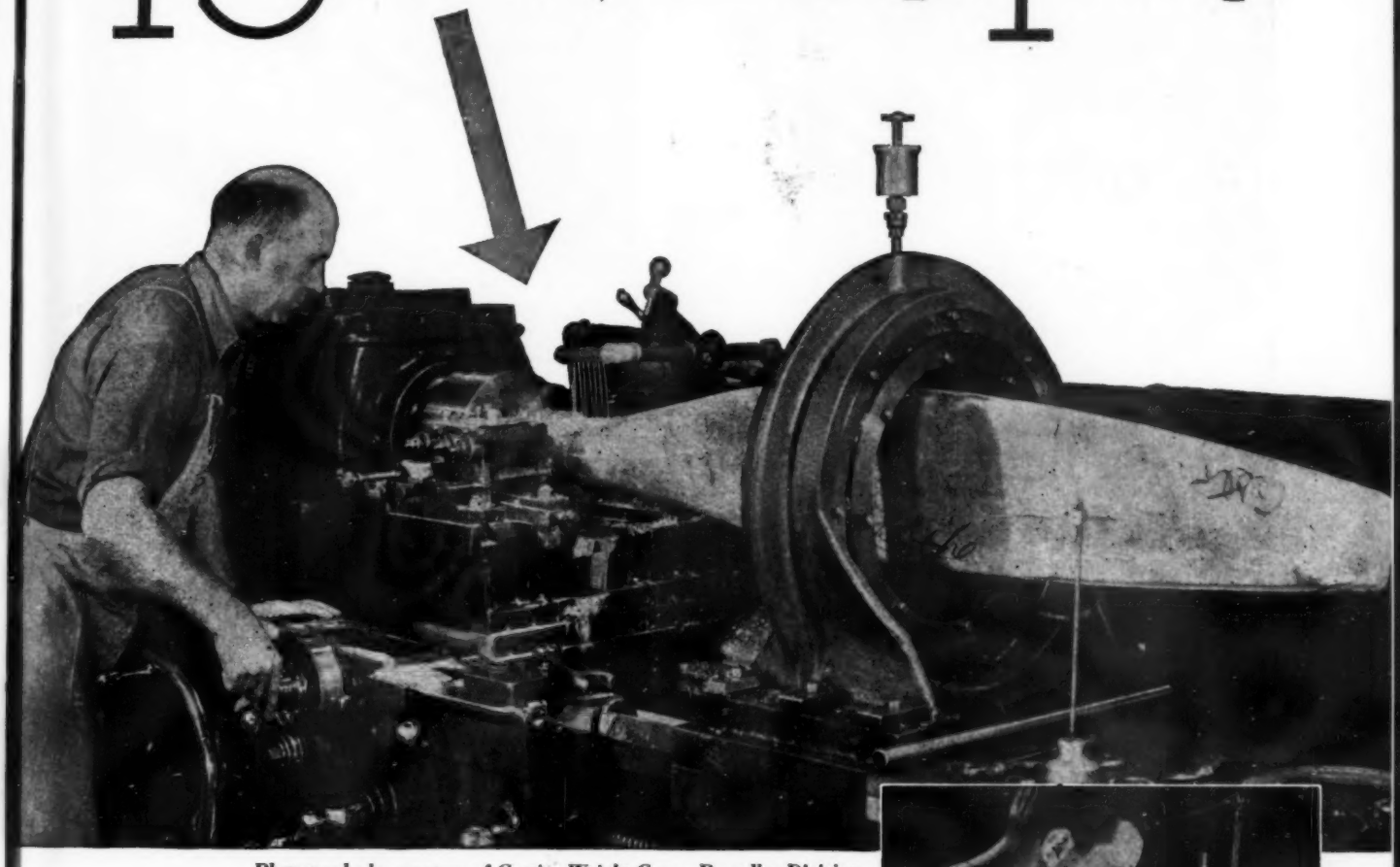
caster, N. Y., is suitable for many other fields. The compact design is available in several models with different lever and pedal arrangements, and permits a completely sealed system, which eliminates the need for a reservoir of any kind. Pressures up to 500 lb. with a displacement of 0.8 cu.in. can be obtained.

Yoder Develops Shell Cropper To Trim Crop End of Forging

By trimming the crop end of a shell forging while it is still hot at the plant, shipping cost can be saved. For this purpose the Yoder Co., 5500 Walworth Ave., Cleveland, Ohio, has developed a shell cropper. By means of a simple adjustment, shell forgings ranging in size from 60 mm. trench mortar through the 155 mm. high-explosive shell can be cropped with this machine. The bottom of the shell forging cavity may be held firmly against the end of the gaging mandrel during the cutting operations, thus the length can be held to close tolerances. This eliminates the cutting-off and facing operations heretofore necessary in the machining line. The shell is cropped at forging temperature.

This machine is nearly automatic in operation, the hot forging being slid from the conveyor over the mandrel. By depressing the start button the cycle is begun. First an air-operated arm to hold the shell against the locating mandrel swings into position. This mandrel, locating from the cavity bottom, gages the shell length. While held in this position, the forging is rotated by the two driven rolls that support it. The disk-type cutter is then fed automatically through the forging wall. A roll located on the mandrel prevents the formation of an internal burr. On completion of the cut, the operator ejects the forging along with the cropped end by actuating an air-operated ejector, and the cycle is repeated.

13 tools..but only 1 setup

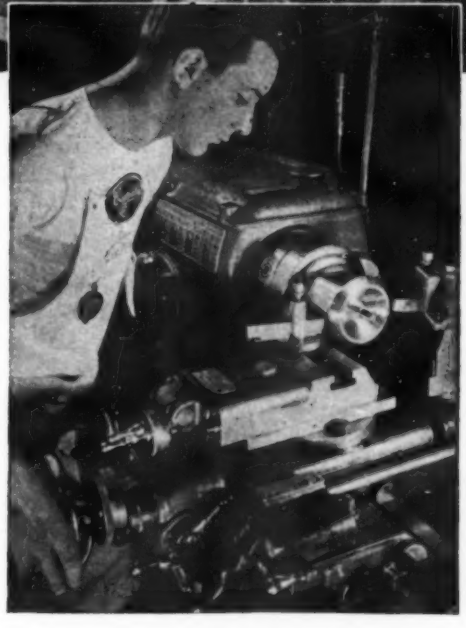


Photographs by courtesy of Curtiss-Wright Corp., Propeller Division

Multiple tool setups are often complicated and expensive, and sometimes prohibitive, but in this case the value of careful job analysis has in practice proved to be productive, accurate and economical.

Requirements in slides, tool function and blade support (details omitted) all combine to the successful machining of propeller hubs, which includes straight turning, taper turning, grooving, etc.

Whether the work be small and delicate or large and rough, our engineers will be glad to work with you in determining efficient methods of machining.

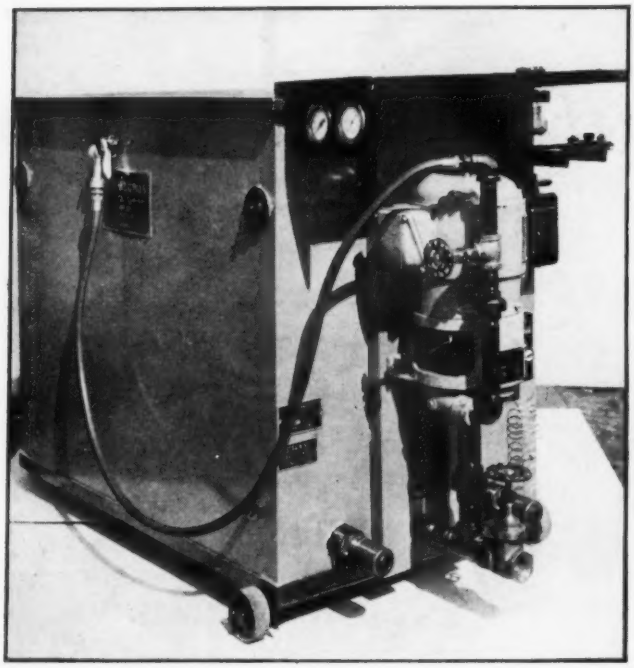


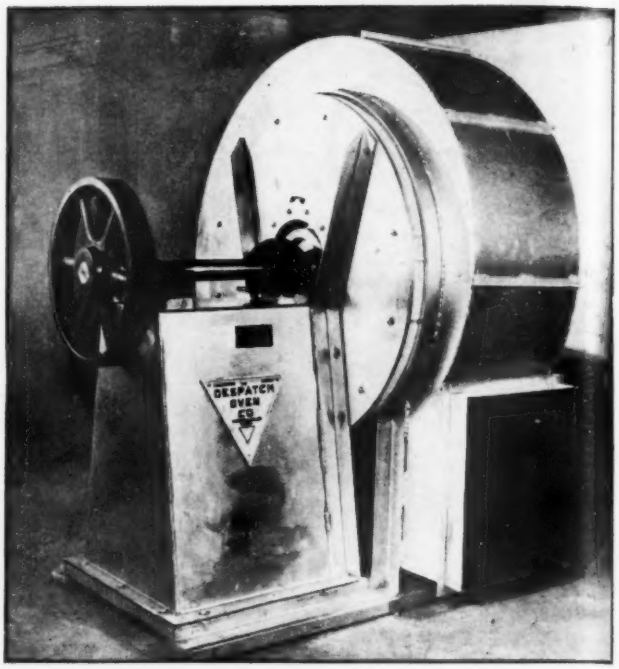
Time is saved. This 12″ Monarch is equipped with double-power angular feed, for machining both angles of a bevel gear, simultaneously.

MONARCH LATHES

COVER THE TURNING FIELD

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO





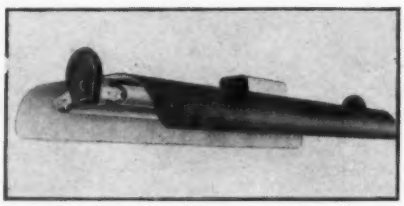
Magnus Parts Washing Machine Handles Them by Three Methods

For cleaning large and small metal parts, Magnus Chemical Co., Garwood, N. J., has announced a portable multi-purpose washing machine. It is made in three sizes and handles parts to be cleaned by three methods: Baskets handle the small or delicate parts, while the larger parts are handled individually on the lower platform, or they may be hung on racks in the solution.

The part to be cleaned may be soaked and agitated in baskets or on the lower platform, or sprayed with cleaning solution by means of a pump and spray gun, or both. That is, they may be soaked in the lower section of the machine and rinsed at the upper level by means of a flush gun. The machine provides agitation of the parts by an up-and-down motion, with 30 8 in. movements per minute. Several types of cleaning solution may be used. The machine is adapted to use of an emulsifiable cleaner. For use with hot alkaline solution, it is equipped with immersed electric heating units, thermostatically controlled. Also, it may be adapted to the use of chlorinated solvents. The sizes of the machine available are the small unit, measuring 24×18×40 in. high; the medium size, measuring 36×24×40 in. high; and the large unit, measuring 48×30×40 in. high.

Generalite Fluorescent Unit Has Easily Removable Reflector

The redesigned Generalite fluorescent lighting units made by Fostoria Pressed Steel Corp., Fostoria, Ohio, have non-metallic reflectors. The reflector is removable without turning off the current or removing the lamps. By loosening two wing nuts, the reflector lifts off the top of the wiring channel. Another feature of the Models MF-240 and MF-2100 unit is the V-shaped wiring channel. This channel separates the two 40-watt lamps used in the MF-240 unit and thereby eliminates light absorption from one lamp to another. The Model MF-2100 uses two 100-watt lamps. Most models are equipped with conventional ballast. Where continuous line lighting or individual four-lamp models are desired, three units are available, MF-2-240 using four 40-watt lamps, MF-2-2100 using four 100-watt lamps, and MF-2-2100-S using four 100-watt lamps, but requiring only one four-lamp ballast. This operates on 265-460 volt, 60 cycle or Y circuit.



All units in the Generalite line are finished on the outside with gray enamel, and the inside of the reflector and the V channel are furnished in high reflective white.

Despatch High Temperature Fan Suits Recirculating Furnaces

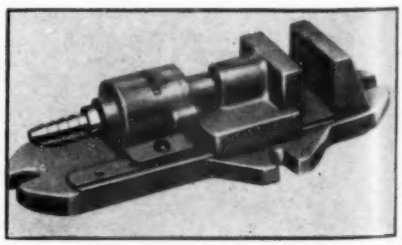
The centrifugal-type, high-temperature fan developed by Despatch Oven Co., 622 Ninth St., S. E., Minneapolis, Minn., has been designed for use in recirculating furnaces of all types requiring high velocity, high volume airflow, such as heat-treating, stress relieving and annealing furnaces, where temperatures of air moved by fan range up to 1,600 F. and static pressures do not exceed 10 in. water gage. The air vent opening in the all-welded pedestal allows the air to circulate freely within the body of the pedestal, which is open at the bottom. The heavy pedestal supports the shaft, rotor, bearings and fan plug as a unit.

To protect bearings from heat developed inside of the fan housing, a patented air cooling system is used. A cast aluminum disk taps the heat from the shaft just outside the fan housing and dissipates it through whirling action. The large surface area of the aluminum disk hastens the air cooling, while its thermal conductivity siphons heat from the shaft before it can reach the bearings. Insulation clips welded to the exterior of the fan housing make it easy to apply insulation.

A combination shaft cooler and airflow switch with wheel is available for the fan. When used on the fan for recirculating furnaces, it prevents the burner or heater from operating until the fan is rotating at the proper speed. Likewise, it shuts off the heater in the event of fan belt failure.

Mead Model 10 Midget Air Vise Facilitates Light Bench Work

The Model 10 midget air vise developed by Mead Specialties Co., 15 South Market St., Chicago, Ill., facilitates a variety of light drill press operations, bench assembly jobs and light milling



MISSION ACCOMPLISHED

...and bearings played their part

HAVE you ever wondered how airplane engines drive warplanes through the air at better than 400 miles per hour—without burning themselves out? Or, how aircraft instruments can be so sensitive that men fly unerringly to a speck in the ocean, and drop bombs with such deadly accuracy?

The free-rolling motion of anti-friction bearings makes these achievements possible. Such bearings reduce friction to the vanishing point...keep mechanisms cool...postpone wear and maintain precise location of parts.

New Departure ball bearings are used by the millions in American war planes. In fact, New Departure has a major responsibility in the whole ball bearing war production program.

NEW DEPARTURE *ball bearings—as near perfection as engineering science can make them—help to keep 'em...flying...rolling ...firing...winning.*

Nothing rolls like a ball

New Departure

THE FORGED STEEL BEARING

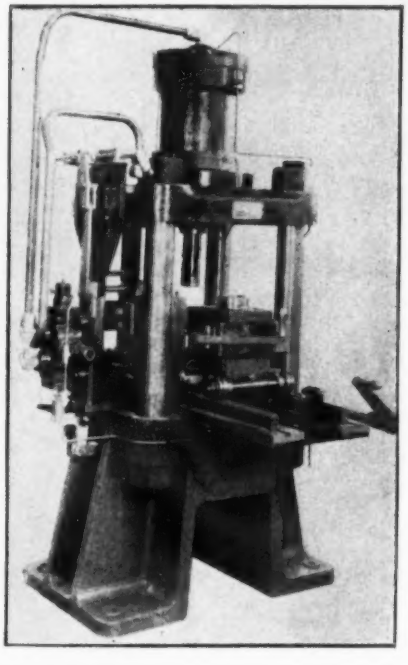
NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

work such as screw slotting operations. The jaw slides on dovetail ways. Three locations for the cylinder are provided to give jaw openings from 0 to ⅝ in., ⅝ to 1¼ in., 1¼ to 1⅞ in. The jaws are 1¾ in. wide and 1 1/16 in. deep and used with a foot control valve. Maximum stroke of this vise is ⅝ in. Its over-all length is 7½ in., and width is 3½ in., with a height of 2½ in.

Hydraulic Builds Presses In Four Ranges of Size

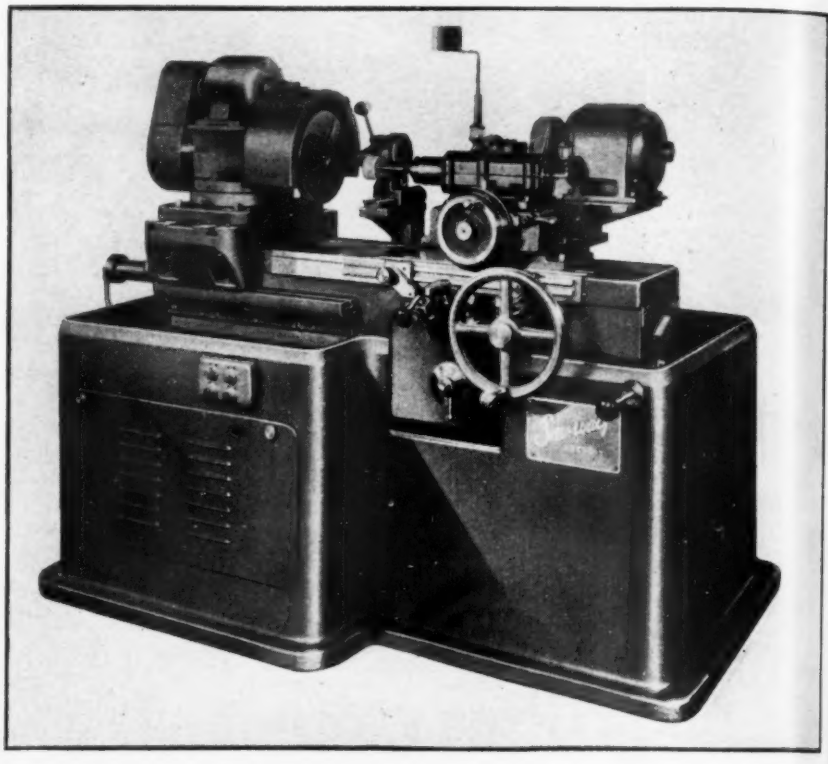
The Model K series hydraulic press, developed by Hydraulic Machinery, Inc., 12825 Ford Road, Dearborn, Mich., is available in 25, 75 and 100 ton sizes, and may be adapted to capacities up to 150 ton. The press is operated by a separate motor-driven power unit, and manually controlled with a four-way valve that automatically cuts off when the predetermined pressure or tonnage has been reached. The power unit may be installed in another room or building.

Operating pressure of the 75 ton model is 2,000 lb. per sq.in. on the



cylinder. The maximum daylight is 24½ in. This machine has a 10 in. bore and 9 in. stroke. The frame of the press is made of heavy castings bolted together by steel tierods, with the power cylinder assembled vertically on the top and above a base platen 19×13¼ in. on the 75 and 100 ton presses. The platen is 1 in. larger in each dimension on the lighter models, and 1½ in. smaller on the larger ones because of 3 in. instead of 4 in. tierods on the former, and 4½ or 5 in. tierods on the heavier types. The platen is 27 in. from the floor, and over-all height of the 75 ton press is 82 in. The press occupies a floor space of 25×50 in. without the power unit.

Sav-Way Internal Grinder Has Hand and Hydraulic Feed



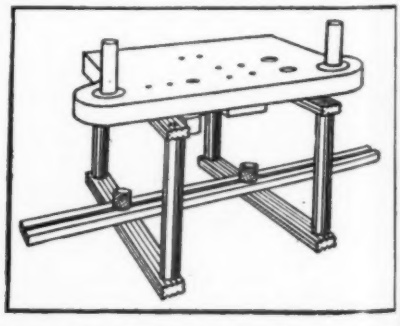
Both hand and hydraulic table operation are provided in the internal grinder brought out by Sav-way Industries, 4873 East Eight Mile Road, Detroit, Mich. Each is wholly independent of the other, though it is possible to use both hand and hydraulic feed in combination on the same job and in the same setting.

Hand operation is said to give the worker complete control for setting up, and is often preferable for short holes, blind holes, and facing. With the hydraulic system, high table speeds by power are obtainable for long holes. These table speeds range up to 55 ft. per min. The maximum table stroke is 24 in., and minimum is ⅜ in.

This grinder occupies a floor space of 105×48 in., and weighs 5,300 lb. Base measurements of the machine are 70×48 inches.

American Grinding Wheel Suited for Hard Steel Use

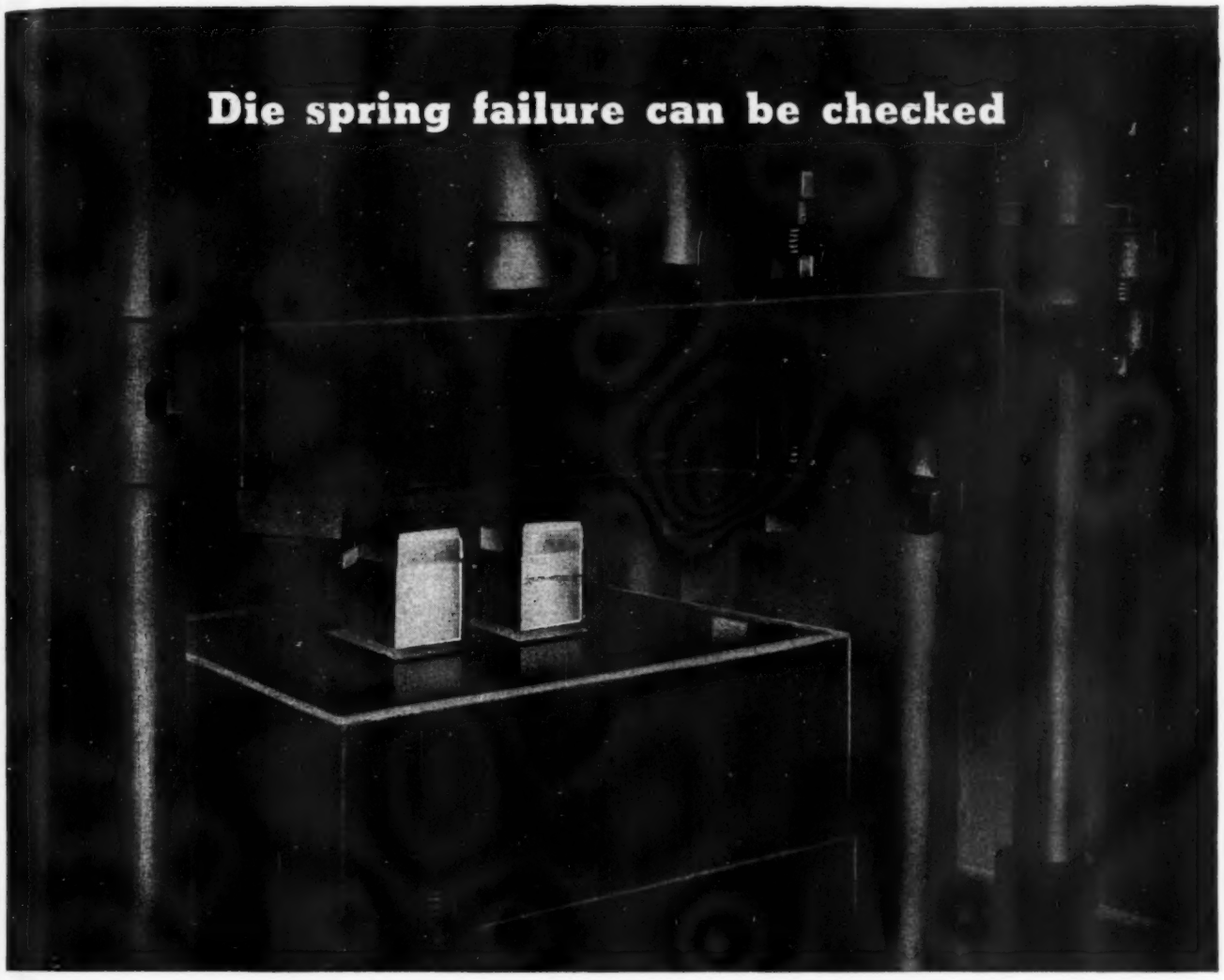
A precision grinding wheel of open, cellular construction, with No. 15 abrasive content, has been announced by American Emery Wheel Works, Providence, R. I., for toolroom use in grinding hard steels. Its porous construction gives considerable chip clearance and space for air cooling to cut alloy steels without loading or "burning." In wet grinding, its porosity enables it to carry extra coolant for cooler cutting.



Acro Tool 3-In. Die Cradle Handles Small Work Sizes

A 3-in. die cradle has been brought out by Acro Tool & Die Works, 5324 North Kedzie Ave., Chicago, Ill. It is made of high grade steel, hardened and ground to close tolerances. This die cradle is designed to handle smaller work sizes than the standard 7-in. unit.

Die spring failure can be checked



Information supplied by an Industrial Publication

A recent investigation of die spring breakage developed the following prominent causes:

1. Hydrogen embrittlement resulting from plating, pickling or cleaning.
2. Incorrect die design.
3. Incorrect spring size.
4. Speed of compression cycle.
5. Poor quality of wire.

There are, fortunately, remedies for all these conditions. Hydrogen embrittlement can be corrected by heating plated springs to about 450°F. and air cooling.

Faults in die design usually consist of either insufficient or too great clearance between the outside diameter of the spring and the guide hole. The clearance should be such that the spring operates freely, but has no chance to buckle.

Care should be taken in selecting springs to see that they are properly designed for both length of compression stroke and speed of compression. If springs are repeatedly compressed too close to their solid height, quick failure will result. The same is true where the rapidity of compression is too great.

It seems obvious that the quality of the spring wire should be commensurate with the job. Cheap wire should be avoided because of defects that are bound to cause trouble, especially when springs are plated.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

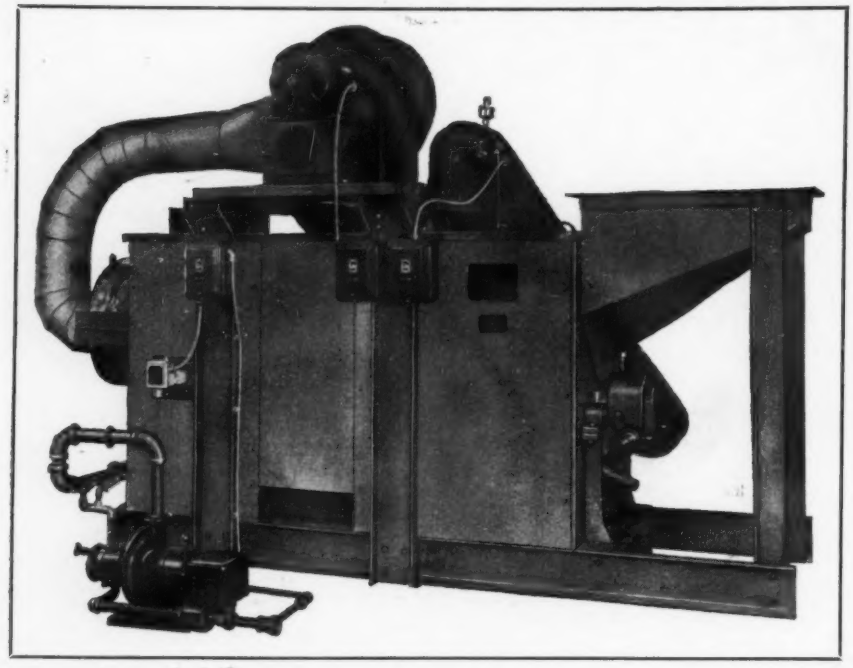
MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Mo-lyb-den-um Company

500 Fifth Avenue • New York City

MOLY

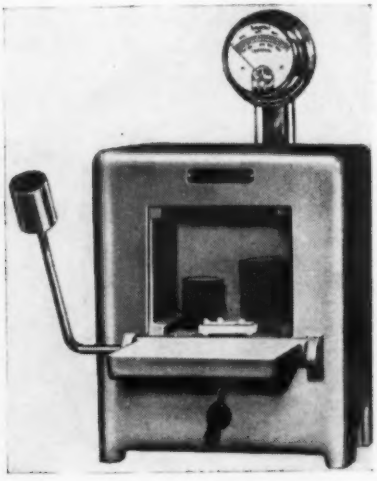
Colt's Autosan Revolving Type Cleaning Machine Automatically Feeds, Dries and Discharges Parts



A compact machine for the continuous drying of small parts, the Model 270 Autosan revolving type machine, has been introduced by Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn. The unit automatically feeds, dries and discharges the parts in one continuous operation. Parts are fed into a hopper, from which they pass into the drying cylinder in controlled volume. The rolling action of the cylinder, and the further action of a series of ribs located on the cylinder wall, agitate the parts as they progress through the machine. They are constantly subjected to a blast of heated air from a duct within the cylinder circulated by a centrifugal type, motor-driven blower. Air is heated by a large steam coil, by gas burners or electric heating units. Capacity of this model ranges from 20 to 45 cu.ft. per hr., depending on the type of work to be dried.

Temco Heat-Treating Furnace Has Three Heat Selections

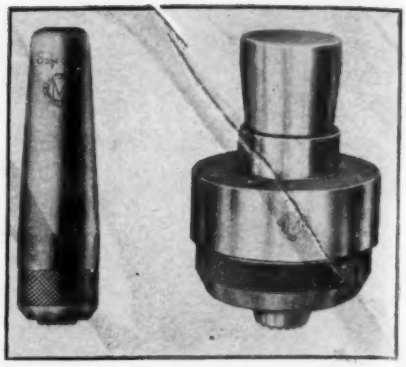
For heat-treating of small metal parts such as gears, tools and dies, Thermo Electric Manufacturing Co., 480 West Locust St., Dubuque, Iowa, has introduced the Temco electric furnace. The body is made of a heavy one-piece casting. The door is counterbalanced for easy operation, and when open forms a convenient loading platform. The internal construction of the muffle is designed to eliminate cracking. The entire heating element is connected in the electrical circuit over the complete heating range.



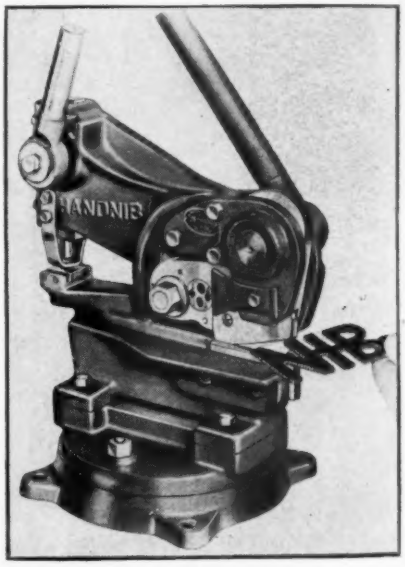
This furnace operates continuously at temperatures up to 1,500 F. and intermittently up to 1,850 F. Heat selection is through a heavy-duty rheostat with three ranges; low, 70 to 400 deg., medium 400 to 800 deg., and high 800 to 1,500 F. The furnace operates on alternating or direct current and can be obtained for use with either 115 or 230 volts. The heating chamber is 4 in. wide, 3¼ in. high and 3¾ in. deep. The outside is 8¾ × 10 × 13½ in.

Matthews Ring Style Holder Will Mark Curved Surfaces

For curved line marking of all types of parts from ¼ to 6 in. in diameter, Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa., has introduced a ring style holder. The holder is economical for use with segment type, which is engraved with one character only, or logo dies, engraved with two or more characters, from 1/32 to ½ in. in size. It is supplied with dovetail self-locking segment type for positive holding.



The ring holder is suitable for marking concave or convex surfaces. Permanent lettering can be engraved on multiple-character logo dies. Single type is used for changeable lettering. Depending on the marking required, interchangeable single character type can be set up in full or part ring. Tuf-Face steel type is used in ring style holders, and is available in letters, figures or symbols.



Handnib Combination Nibbler Cuts Templets and Trial Blanks

National Machine Tool Co., Racine, Wis., has developed a heavy-duty Model No. 5 Handnib combination nibbling shearing, drill rod cutting and punching machine for sheet metal. It is hand operated and cuts templets and trial blanks into any shape desired. Drill rods of 3/16, ¼, 5/16 and ⅜ in. sizes can also be cut with the machine. In addition it will punch holes up to ½ in. through ⅛ in. flat stock. The body is made of cast steel and all wearing parts are hardened and ground. It has double crank construction.

YOUR JOB
belongs on one of these

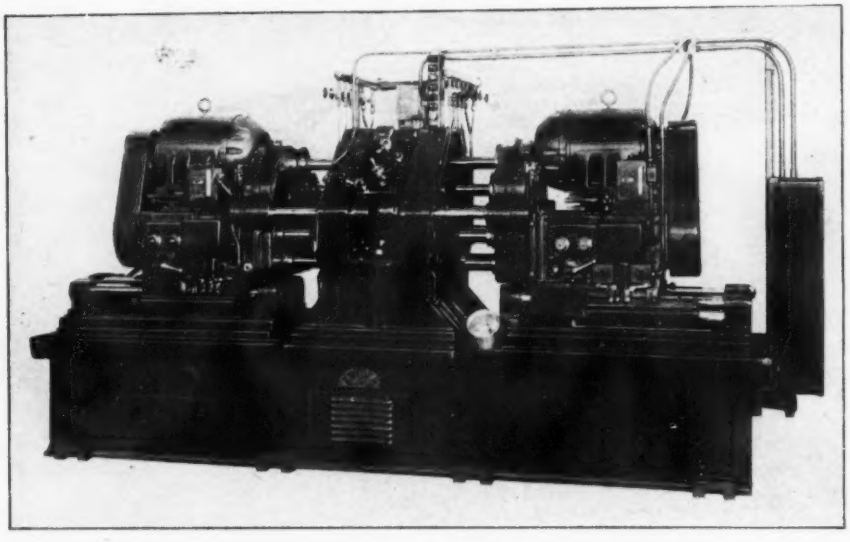
No. 3-A
DUOMATIC
LATHES

Write for comprehensive descriptive Bulletin No. 601

Proudly worn since March 6, 1942

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.
ENGINE TOOL ROOM AUTOMATIC LATHES

Snyder Machine for Drilling, Boring Wristpin Holes Is Provided With Three Successive Working Stations

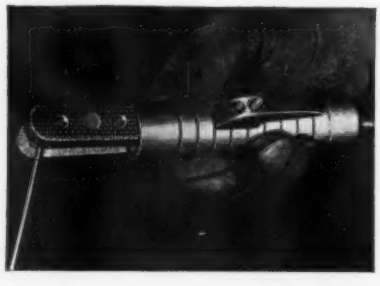


Three successive working stations are provided for drilling, redrilling and semi-finish boring the wristpin hole in aircraft engine pistons in the hydraulically operated double-end drilling and semi-finish boring machine built by Snyder Tool & Engineering Co., 3400 East Lafayette St., Detroit, Mich. This machine has four fixtures mounted on a four-station trunnion index unit. Each fixture is designed to take two pistons which are located and clamped manually in place. When this is done, the operator pushes the cycle button and the fixture is indexed from station to station by an electrically-driven Geneva index mechanism. Tools, driven by six-spindle multiple heads, feed into the piston from both sides. Each set of the spindles is operated by a 10-hp. motor.

In the first and second drilling stations, the tools are guided in conventional drill bushings. The semi-finished boring bars in the third station are guided by revolving bushings on the trunnion side members. A large tank near the rear of the machine holds the coolant which is directed against the drilling tools and pistons in all stations. The top of this coolant tank serves as a removable chip tray.

Wade No. 8A Toolmakers Lathe Has Steel Cabinet Mounting

A steel cabinet mounting for the No. 8A toolmakers lathe has been developed by Wade Tool Co., Waltham, Mass. Space in drawers and cupboard at the right side of the cabinet is arranged for collets and other attachments. This machine is a precision, screw cutting, backgeared lathe with 1-in. collet capacity. The motor and drive are contained in the cabinet and offer 12 speeds arranged in geometric progression from 25 to 2,000 r.p.m. Other speeds higher or lower are optional.

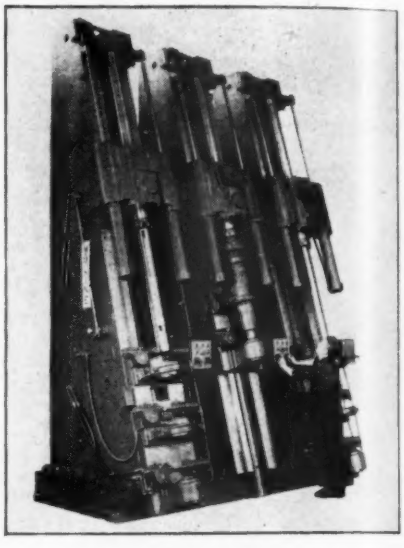


Jackson Electrode Holder Is Insulated to Protect Eyes

Jackson Products, Detroit, Mich., has available the Model F-1 welding electrode holder which is light, slender and easily handled. This holder is made of high conductivity copper alloy, and is insulated to protect the welder's eyes against flash, thus eliminating work spoilage. The rated capacity of this unit is 200 amp., and takes rods from the smallest up to 3/16 in. The over-all length is 7⅞ in., weighs 12 oz. The holder is provided with mechanical or solder cable connections.

Moline Special Boring Machine Handles Heavy Cylinder Sleeve Work

For boring cylinder sleeves and facing the ends of large diesel engines, Moline Tool Co., Moline, Ill., has announced the MR114 special boring machine which consist of three machines built together to form one three-column



unit. Each machine is operated independently of the others.

The boring spindle thrust bearing assembly and the fixture on each column move on inclined ways and the boring tools are piloted above and below the work. Two motors are used on each column, one to drive the spindle, and the other to drive the hydraulic feed unit. Two spindle speeds are available by means of a lever. All operations of the machine are controlled by a combination of pushbuttons, and selector switches, and electrical interlocking prevents possible errors in operating sequence. Automatic lubrication of the ways and spindle drive gears is provided.

On each column, the fixture is set in the extreme down position for loading and unloading. It is set in the extreme up position for boring, and for facing operations there is an intermediate location which permits the operator to watch the action of the facing tools. This boring machine occupies a floor space about 8×11 ft., and has an over-all height of 17 ft. 9 in., weighs 77,200 lb.

Lempco Bench Type Arbor Press Has Notched Pressing Block

Lempco Products, Inc., 5682 Denham Road, Bedford, Ohio, has introduced a 2- and 3-ton bench-type arbor press. Work up to 14 in. diameter can be

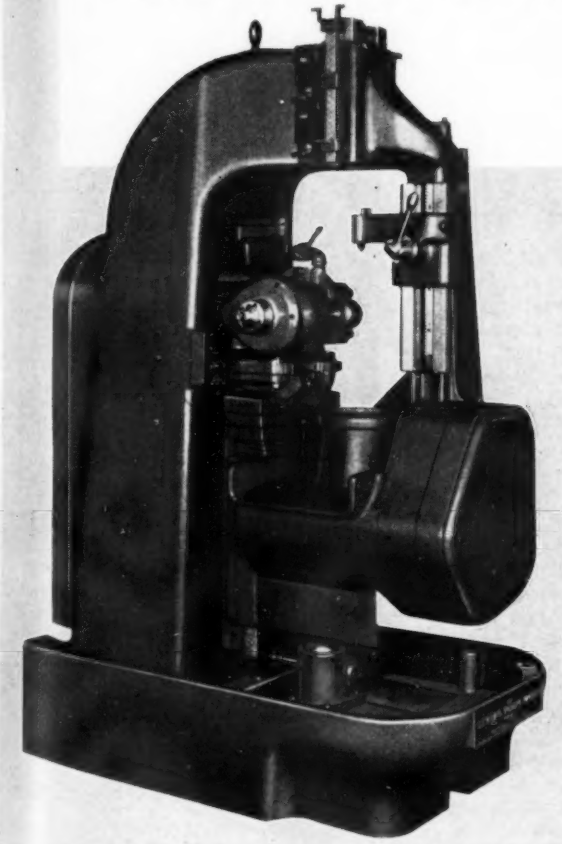
The RIGIDHOBBER for Precision Performance

● Whether the job is hobbed splines or gears you are assured of precision to closer tolerances with the Rigidhobber. Being of vertical design with moving workhead and stationary hob head both units are given positive support during entire cutting operation. This construction is universally recognized as providing maximum rigidity.

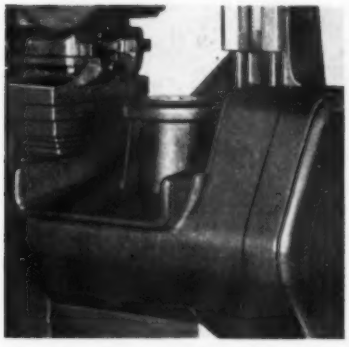
Simplicity of Control

A modern electrical system permits rapid traverse motion of the workhead to the hob, feed motion through the cutting portion and rapid traverse back to loading position to be controlled by a single push button. Nothing difficult about this operation to require particularly skilled help. For precision performance on long or short runs—specify the Rigidhobber. Furnished in two models Nos. 140 and 145.

For high production of duplicate work Cleveland Hobbing recommends the 8 Spindle Rotary Rigidhobber.



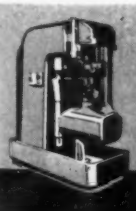
HOBBING HELPS FOR BOOSTING WAR PRODUCTION



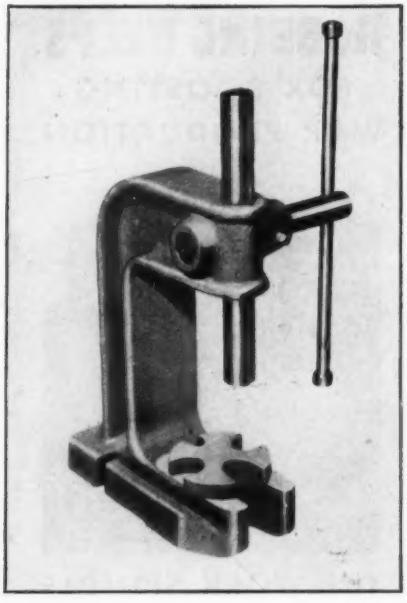
THE WORK SPINDLE

● The work is held vertically between the tailstock and work spindle. The work spindle must be mounted in rigid accurate bearings. The spindle invariably runs slowly and must be well preloaded to withstand cutting pressure of tool. The face of the spindle must be square with the hole and large enough to support the largest diameter gear that can be cut on the machine. The hob arbor and work spindle are connected with gearing so that the ratio between the two can be accurately determined at all times.

For complete details write for the illustrated bulletin. It shows many construction features and other points of interest to users of hobbing machines.



The CLEVELAND HOBBING
Cleveland ... MACHINE Company ... Ohio
BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS



accommodated on the press. The snap ball chuck permits the ram to be "spun" down to the work quickly. The heavy wrought steel pressing block is notched with 1⅛, 1⅝, 1⅞, and 2 in. openings. Machined bearings reduce friction. This press provides adequate means for assembling, disassembling, bending, straightening and operations requiring up to 3 tons pressure. It is made in both bench and wall type.

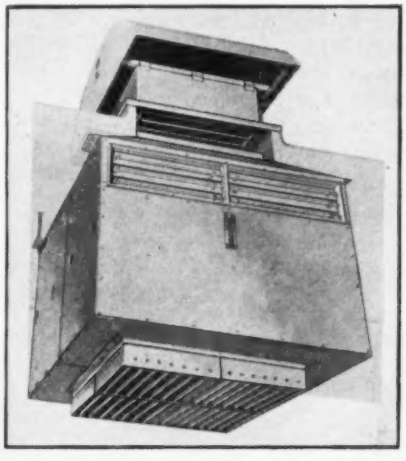
Turner Makes Glass Plug Gages With Same Tolerances as Steel

A line of glass plug gages, ranging in size from ⅜ to 2¼ in. in diameter, has been introduced by Turner Gauge Grinding Co., Ferndale, Mich. These gages are made to the same tolerances as steel gages. However, they are not subject to corrosion. Scratches and slight chipping on the glass will not burr the gage nor affect its function.

Vertivent Heater, Ventilator Offers Plant Air Control

The Vertivent heater and ventilator has been developed by Young Radiator Co., Racine, Wis., for installation in plant roofs. This unit offers controlled ventilation and air tempering, and its output can be automatically regulated to meet requirements. It is furnished of steel or non-metallic construction, painted with a prime coat. The frame is rigid angle iron with heavy mounting brackets. A convenient door provides access to coils, motor and fan.

A ventilator type air intake section is mounted on the roof, and fresh air is drawn in through dual heating coil and uniformly distributed. The fan and power units are inclosed in the housing suspended in the building.

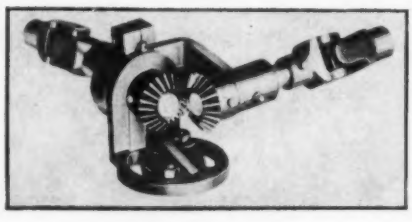


The hood which covers the air intake prevents light leaks during blackouts and also protects against weather.

Three models ranging in capacities of 5,000, 10,000 and 15,000 cu.ft. per min. are available, with fan diameters of 30, 36 and 42 respectively.

Dean Universal Angle Drive Features a Flexible Shaft

The universal angle drive brought out by Payne Dean & Co., Laconia, N. H., has been developed for more convenient hand control of valves and other devices. The gear shafts are placed at 90 deg., but one shaft is mounted in a swinging bracket bearing that rotates on the outer bearing surface of the other bracket through a 200 deg. angle. With special construction it will rotate through the full 360 deg. circle. This movable bracket has a large bearing surface and is provided with a slit clamp tightened by a socket setscrew. The bracket may be locked in any position through the 200 deg. range and held in place rigidly against operating strain.



Two circular slots are provided in the base allowing further movement of about 90 deg., and when the drive is provided with two universal joints practically any angle of operation may be obtained.

This device is capable of controlling low pressure valves up to 10 in. diameter.

Cochrane 2-Pen Flow Meter Shows Related Flow Records

A 2-pen electric flow meter, developed by Cochrane Corp., 17 St., and Allegheny Ave., Philadelphia, Pa., is suitable for use where panel space is at a premium, or where it is desired to have two related flow records on the same chart for comparison. Both receiver mechanisms can be swung out and operate in that position.

The red target moves to the right or left from the center point on the scale, and thus shows at a glance whether there is an excess or deficiency of one of the quantities with respect to the other. Since the pointer movement is two and a half times greater than the difference between the two recording pens, it is more readily noted.

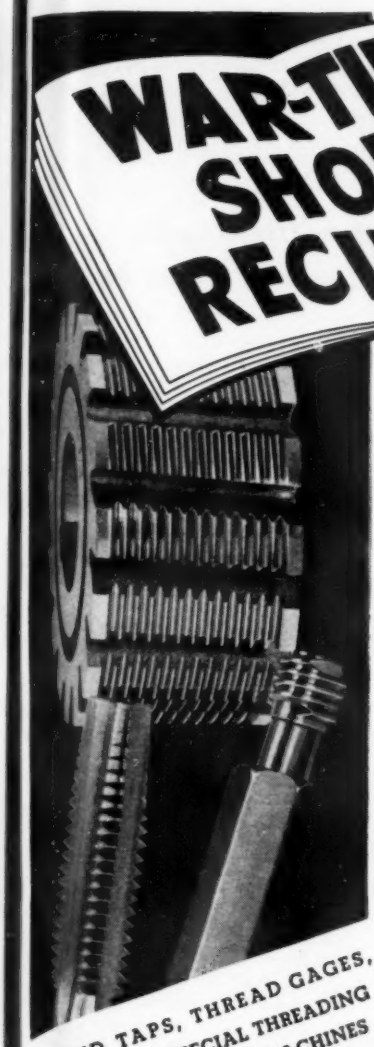
This meter serves to indicate the measurement of controlled atmospheres and flow of oil to quenching tanks.

Apeco Photocopy Machine Will Fit on Desk or Table

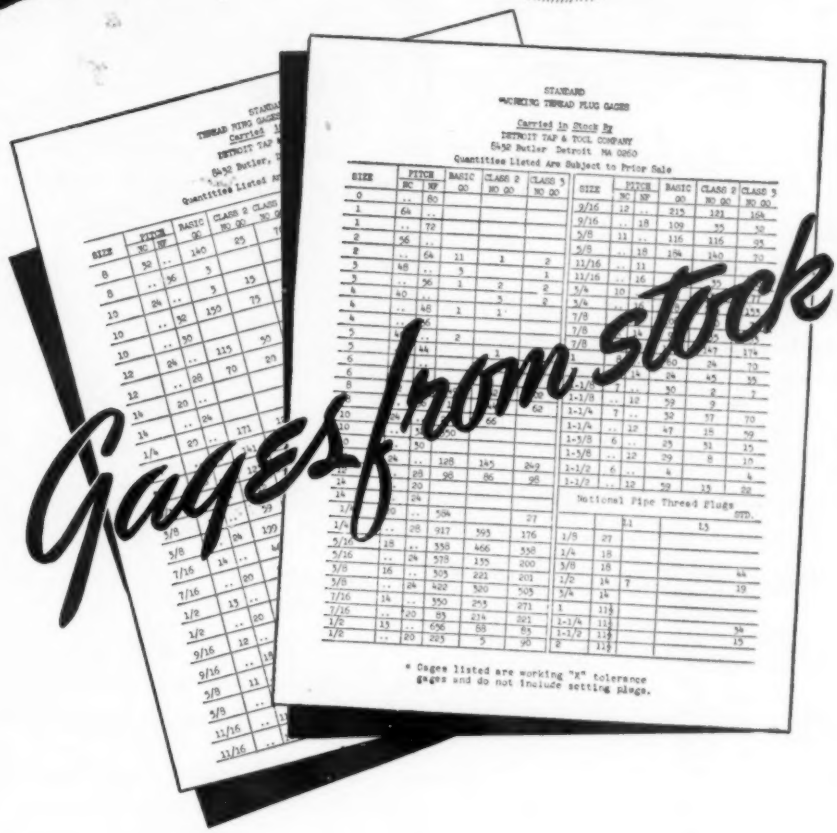
Exact photo copy of blueprints, any written or printed material as well as drawn or photographed material, can be produced with the Apeco photocopy machine made available by American Photocopy Equipment Co., 2849 North Clark St., Chicago, Ill. The machine is small enough to set on any desk or table and makes the same size copies of anything up to 18×22 in. No working parts are used in the construction of this unit, thus pre-

WAR-TIME SHOP RECIPES

#5 for thread production



GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES


STANDARD
WORKING THREAD PLUG GAGES
Carried in Stock By
DETROIT TAP & TOOL COMPANY
8432 Butler Detroit MA 0260
Quantities Listed Are Subject to Prior Sale
National Pipe Thread Plugs
* Gages listed are working "A" tolerance gages and do not include setting plugs.

Gages from stock

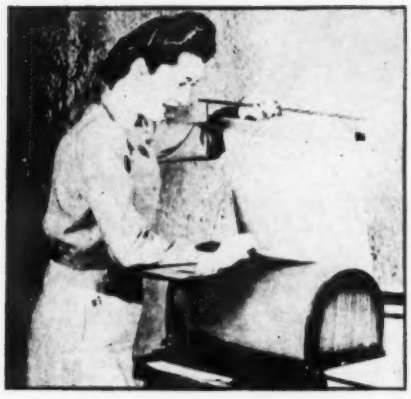
Need some particular thread gages in a hurry? Here's your best bet: *Every two weeks* Detroit Tap issues to its field representatives lists showing sizes and quantities of standard thread gages available from stock in Detroit. Chances are your size may be readily available. It only takes a phone call to find out. Pick the nearest one from those listed below:

CHICAGO	KEdzie 3170	PITTSBURGH	MAyflower 3177
CLEVELAND	HEnderson 6113	ROCKFORD	MAin 2243
DETROIT	MAdison 0260	ST. LOUIS	CEntral 4435
DENVER	KEystone 7229	ST. PAUL	GArfield 4341
FLINT	FLint 4-2624	SYRACUSE	SYracuse 8-1462
HOUSTON	CApitol 5634	TOLEDO	GArfield 8017
INDIANAPOLIS	RIley 9393	IN CANADA	
LOS ANGELES	KImball 9111	MONTREAL	MArquette 5346
MILWAUKEE	DAly 4256	TORONTO	WAverly 2688
NEWARK, N. J.	MArket 3-1492	WINDSOR	WIndsor 4-9229

Perhaps you would like to receive copies of these gage stock lists regularly? Make a phone call today, or write:

DETROIT TAP & TOOL CO.

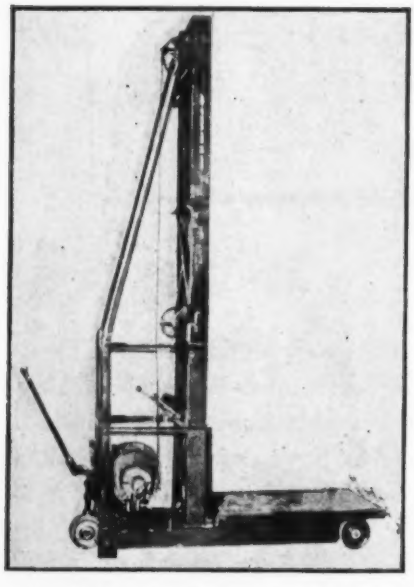
8432 BUTLER STREET, DETROIT, MICHIGAN, U.S.A.



senting a minimum of repair or maintenance problems. This photocopy machine operates on alternating or direct current, measures 12×12×24 in. and weighs 10 lb.

L.-S. Air Power Stacker Has Explosive Atmosphere Use

Lewis-Shepard Sales Corp., Watertown, Mass., has developed an air power stacker, which is essentially a portable elevator for use in connection with various hazardous operations. It is powered by an air motor, and a cable



control stops the air motor and stacker platform as soon as the operator removes his hand from either one of the dual holdover controls. In the hinged and telescopic type, upper and lower limit stops automatically operates to prevent over-ride when lifting or lowering.

Swivelier Machine Light Unaffected by Vibration

The Swivelier machine-lighting unit made by Reliance Devices Co., Inc., 510 Sixth Ave., New York, N. Y., has been designed so that it is unaffected by machine vibrations because of a special spring construction inside the base and socket of the swivel base. The socket adjusts to 90-deg. vertical range and rotates 350 deg. horizontally. The arm in the base also has these adjustments. Spring tension construction holds the complete unit in place at any angle.

The unit is suited for attachment to machines, walls, ceiling, work-

benches, drafting boards, and so forth. A choice of arm lengths is available as well as base and socket combinations, with switch in the base and keyless socket or switchless base and key socket. Three types of shades are available for the Swivelier unit.

Y. & T. Makes Telescopic Lift, Tilting Fork Truck

Loads up to 2,000 lb. can be handled with the bantam size telescopic lift, tilting fork truck made available by Yale & Towne Manufacturing Co., Philadelphia Div., Philadelphia, Pa. This truck has four speeds forward and reverse, with all controls in easily accessible positions, and the hoisting and tilting controls are fitted with mechanical limit safety stops.

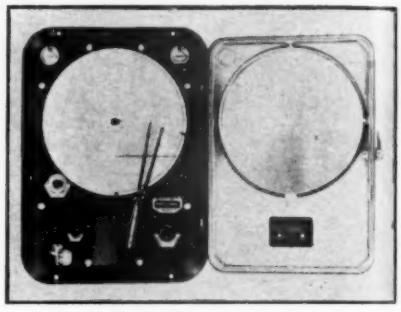
This Model KM30-2 fork truck is

flexible and can be manipulated in close quarters carrying full capacity loads. It measures 98 in. from the 30-in. fork tip to the stern, with a single fork height life of 71½ in., and an additional telescopic lift reaching to 129 in.

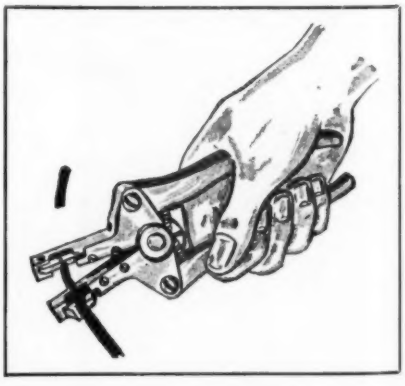
Bristol Free-Vane Controller Suits Varied Process Control

An air-operated automatic control instrument, a convertible free-vane controller, has been announced by the Bristol Co., Waterbury, Conn. This instrument is made for automatically controlling temperatures up to 3,600 F., flow, liquid level, pressure, pH value, draft humidity, and time program.

A number of design refinements have been incorporated which simplify the instrument. It has been designed



so that the user can convert from one type of control system to another. Adjustments for fitting the controller to the requirements of the process are located on a dial board above the chart. This unit is offered in monoset, ampliset, preset, reset and magniset types.



Speedex Wire Stripping Tool Used for All Types of Wire

The Speedex wire stripper brought out by Wood Specialty Manufacturing Co., 919 Taylor Ave., Rockford, Ill., is suitable for stripping all types of wires, solid or stranded. It is made to fit wire sizes No. 8 to 30. Different sizes of cutting blades are interchangeable and are available separately for this tool.

A special B model has a hold-open feature for stripping fine stranded

WHEN "Correct" DESIGN IS "Wrong" DESIGN

Each gear or spline finishing process superimposes individual modifications on the fundamental "correct" design of a hob or shaper cutter.

If you are going to finish-hob or finish-shape you may need one kind of a semi-finishing tool.

If you are going to finish by grinding, you may need a different kind of a semi-finishing cutter or hob.

If you are going all-out for accuracy by using "gear-shaving", you may need a still different kind of cutter or hob—a "PRE-SHAVE" tool.

The differences are small. Usually they are measured in thousandths. But those thousandths spell the difference between a correctly "DESIGNED" and a correctly "PERFORMING" gear or spline cutting tool.

That's why Michigan hobs and shaper cutters do such an outstanding job. They are engineered to the finishing process employed as well as being fundamentally correct. Our engineering department will be glad to tell you whether or not you are really using the right gear cutting tool or what changes you should make to improve gear quality.

BUY U.S. BONDS STAMPS

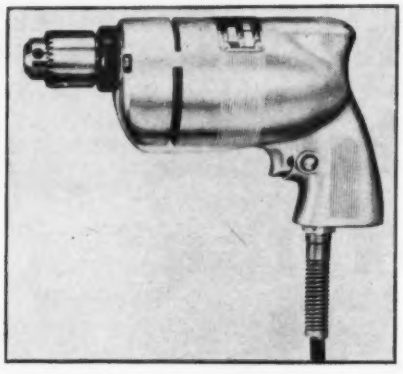
MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD • DETROIT, U. S. A.

wires The jaws hold open automatically until the wire is removed. This type stripper is also suited for use on solid wire.

Skildrill Heavy-Duty Drill Suited for Steel Up to ¼ In.

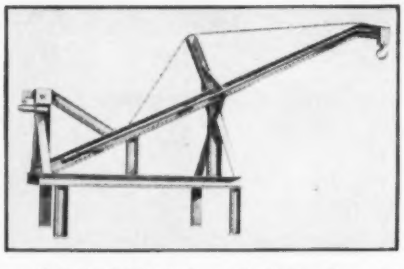
For production drilling jobs up to ¼ in. in steel and ½ in. in wood, Skilsaw, Inc., 5033-43 Elston Ave., Chicago, Ill., has introduced the Model 47 heavy-



duty Skildrill. It is made to fit the hand conveniently, measures 7¼ in. long and 2 9/16 in. wide. The universal motor is available in four speeds, 1800, 2500 and 3500 and 5000 r.p.m. The Skildrill weighs 3½ lb.

Palmer-Shile Makes Boom Skid Which Fits Lift or Fork Truck

A boom skid has been developed by Palmer-Shile Co., 780 South Harrington St., Detroit, Mich., which can be

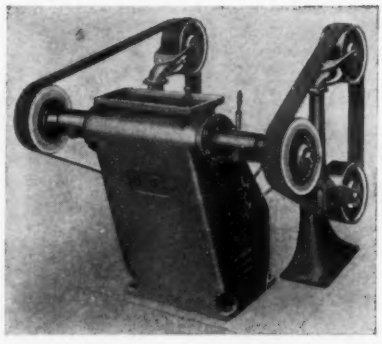


applied to high-lift or fork trucks and is capable of picking up and moving heavy objects of any weight load allowed by the truck's balance. This boom is made of fabricated steel of all-welded construction. The unit measures 114 in. long, the base being 54 in., and the boom extends 60 in. beyond the base. The weight of the skid is 350 lb.

Jones Abrasive Belt Idler Takes Belts Up to 6 In. Wide

Jones Engineering Co., Ellwood City, Pa., introduced the No. 120 abrasive belt backstand idler. It is a floor-type model which can be connected to any regular grinding or polishing lathe.

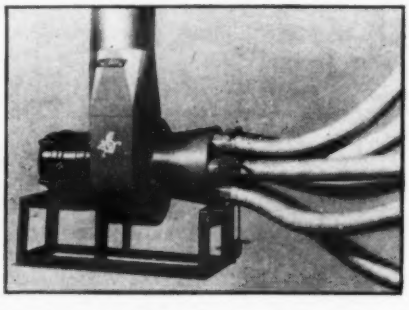
Conveniently located controls are provided at the front of the machine.



It has adjustable spring belt tightening and positive screw belt aligning, and will take any belt size up to 6 in. wide. It is designed for belt speeds up to 10,000 surface ft. per min., and is so built that simple dust collecting hoods can be easily installed.

Chelsea Fume Exhauster Is Suited for Suction Use

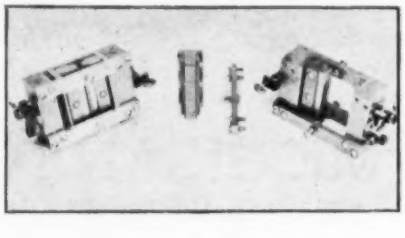
Features incorporated in the fume exhauster developed by Chelsea Fan & Blower Co., Inc., 1206 Grove St., Irvington, N. J., protect fumes, gases, dust, filings and grinding compounds from coming in contact with the motor. The centrifugal type blower wheel is made of ⅛ in. thickness of steel. It



is equipped with a 3-hp. ball bearing motor. The framework is welded into a strong unit with handles for carrying. The adapters are interchangeable and can be used for suction or blowing as desired.

Baldwin Makes Jig to Test Yield Strength in Sheet Metal

Baldwin Locomotive Works, Philadelphia, Pa., has developed a jig for the determination of compression yield strength in aircraft sheet metal by testing a single thickness of sheet rather than by the customary method of obtaining values for compression yield by



testing the sheets in packs. The sheet is tested by supporting it in the jig with a multiplicity of small rollers. The extensometers are attached to the edges of the sheet.

Cramer Percentage Timer Controls A. C. Time Cycle

A percentage timer has been introduced by R. W. Cramer Co., Centerbrook, Conn., which automatically controls the percentage of time at which any alternating current circuit can be periodically closed or opened out of a definite length of a time cycle. This

device is particularly applicable where one function bears a definite time relation in percentage or operation of a second function, such as to regulate any input to electrically-operated furnaces, ovens or heaters, and controlling the proportionate flow of chemicals for boiler feed water treatment.

It has a self-starting synchronous motor which drives a cam-operated switch mechanism through an inclosed gear train. Varying the position of the stationary cam, which is fixed to a calibrated dial, alters the relation between the contact mechanism and opens and closes it at the cycle indicated on the dial.

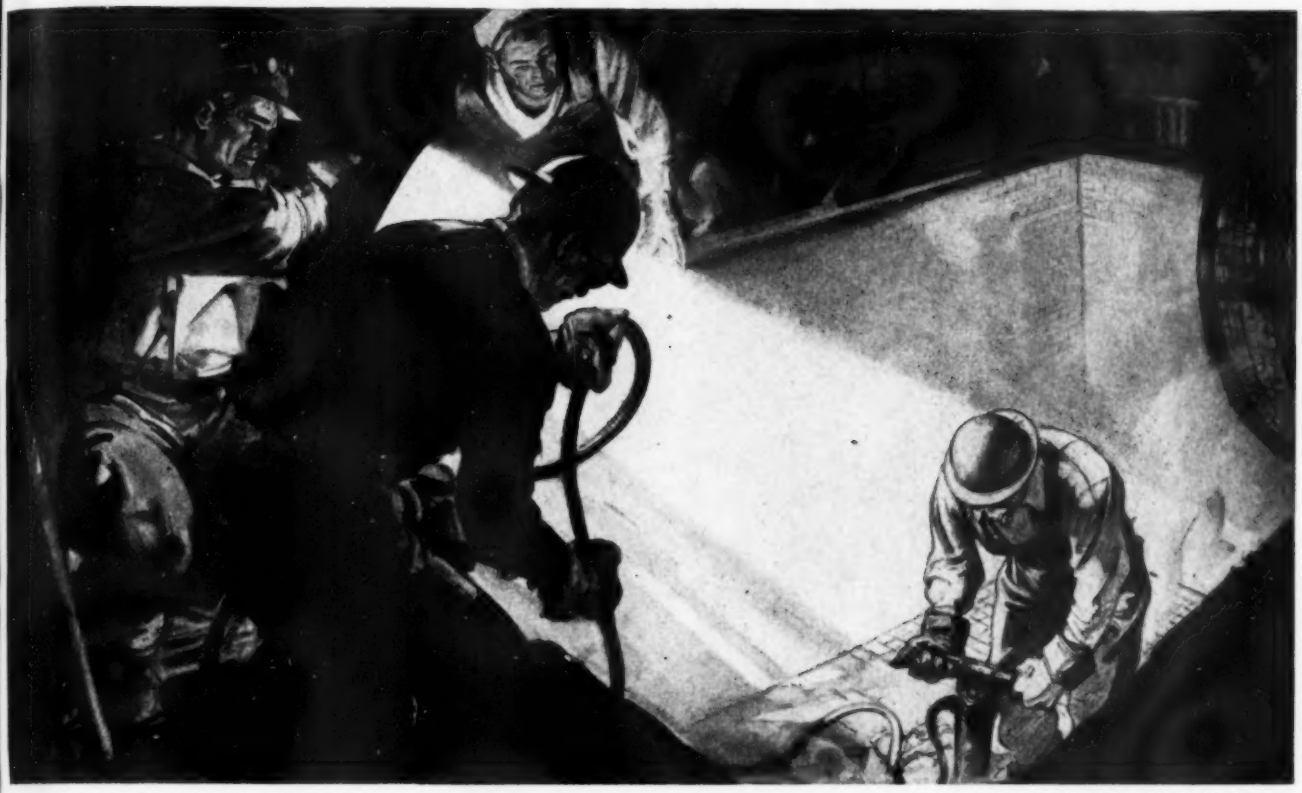
The timer is inclosed in a dust-tight case for flush mounting 3¼ in. diameter and 3 9/32 in. over-all length. It can also be furnished with various types of surface mounting steel connection boxes. The single pole, single-throw contact is rated at 10 amp. at 115 volt, or 5 amp. Seven time ranges are available.

NEW MATERIALS

Alexite Skin Protector Cream Offers Dermatitis Protective

Alexite skin protector cream has been developed by Alexite Engineering Co., Alexander Film Bldg., Colorado Springs, Colo., for protection of workers' skin from the danger of dermatitis. It forms a barrier against skin absorption of water, oil or grease-

By being prepared for any emergency, J&L is producing more steel for war



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FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

MAINTENANCE MEN HELP SPEED WAR-STEEL PRODUCTION

Crews of maintenance men on the steel front, made up of skilled workers of practically every trade and craft, are keeping all required facilities on the job producing steel for war. Employing every precaution for safety in getting at hot furnace repair jobs quicker, and getting them done faster (illustration shows crew reconditioning soaking pit furnace bottom), these men work in short relays and use powerful airplane-propeller fans to supply them with fresh, cooling air. Maintenance supervisors have their fingers on the pulse of every furnace, mill and machine in the works. They have tools and replacement parts ready at hand for the emergency when it occurs.

The 650,000 workers in America's steel industry are making the most of every minute to push past their present high rate of production — 85 million tons of steel a year — every ton of it steel to provide our fighting men with equipment, arms and ammunition to crush enemy forces and protect our own.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR

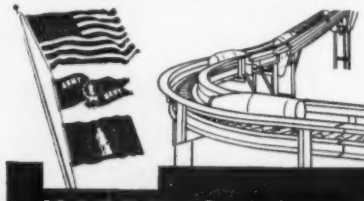
J&L STEEL

THE *Strategy* OF MAN-POWER

RELIEVING VITAL MAN-POWER of unnecessary fatigue . . . avoiding unnecessary handling . . . saving unnecessary steps . . . keeping a constant flow of material moving to waiting hands and machines, that's man-power strategy headed towards victory.

America's war industries from coast to coast are improving their per-man-and-machine-hour production schedules with the aid of Mathews Time-Coordinated Conveyer Systems.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION



If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYER COMPANY ELLWOOD CITY PENNSYLVANIA

carried irritants, and guards against fumes, scale, dust, iron oxide, welder's glare, paint, and other skin irritants. Alexite is a soft, scented, non-greasy cleaning aid which can be removed easily with soap and warm water. This cream is made with a micaceous mineral that is ground into a fine powder which forms the base.

Sterling Varnish Stripper Aids Removal of Splashes

Scraping to remove excess varnish after application to electrical equipment such as rotors, stators and armatures can be eliminated by first applying a stripping medium known as Sterling S-159 stripper, which has been introduced by Sterling Varnish Co., 105 Ohio River Blvd., Haysville, Pa. It is a blue viscous liquid that dries in a few minutes, after which the varnish is applied in the usual manner. When the varnish treatments are finished, any varnish which has splashed or drained on parts where it is not required can be easily removed with a knife without marring the surface.

Hanson-Van Winkle-Munning Makes Small Diameter Buffs

Small diameter buffs used as headed-up wheels for polishing in places difficult to get at are now available from Hanson - Van Winkle - Munning Co., Matawan, N. J., from 1 in. diameter and up. They are spirally sewed with ¼ in. or reinforced pinhole center. Sections are 30 ply by ⅛ in. spiral sewing. Any number of sections may be glued together to make up thickness of the wheel desired.

Meyercord Decal Nameplates Are Made Wear-Resistant

Two types of scratch- and wear-resistant decalcomania nameplates have been developed by Meyercord Co., Lake & Lorel Sts., Chicago, Ill. Type C is an open-letter design for use on crinkle finish metal and is supplied in non-metallic colors. The Type G is a background transfer design for application upon crinkle finish and polished metal, principally aluminum. This design is offered in a wide color range. By test it has been found resistant to salt water.

Sherman V-26 Wrapping Paper Protects Parts From Corrosion

For protecting highly finished metal parts against corrosion, Sherman Paper Products, Inc., Newton Upper Falls, Mass., has introduced the V-26 wrapping paper which is greaseproof and non-corrosive.

Multiple wrapping operations are eliminated by combining two protective laminations in one paper. The inner ply provides a greaseproof barrier,

while the outer ply protects the grease-proof feature against damage in transit. The paper consists of neutral kraft, colored red, and creped for flexibility in wrapping, with a dead-limp folding quality. It is available either with outer film of wax that provides a self-sealing surface, or uncoated where the self-tack quality is not required.

Johnson Soldering Fluid Suited for Metal and Steel

No. 6 non-acid soldering fluid brought out by Lloyd S. Johnson Co., 2241 Indiana Ave., Chicago, Ill., is suited for soldering deep-coated sheet metal, lead-coated sheet metal, tin plate, terne-plated, brass, copper, steel and all types of sweat fittings. It is highly concentrated and may be diluted with one to two parts of water for materials that are easy to solder.

Goodrich Announces V-Belts In Wire-Reinforced Types

Two types of wire-reinforced V-belts have been announced by B. F. Goodrich Co., Akron, Ohio. One has a cable cord construction, and the other a grommet construction which incorporates a wire cord placed in the center of a cotton or rayon grommet. Advantages of the wire reinforced V-belt type are greater horsepower capacity, increased tensile strength and low stretch.

TRADE PUBLICATIONS

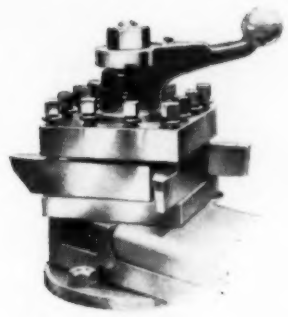
BEARINGS A 16-page booklet explaining the manufacturing procedure in renewing worn ball bearings may be secured from the Ahlberg Bearing Co., 3025 West 47 St., Chicago, Ill.

BELT DRIVES Released by Cling-Surface Co., 1048 Niagara St., Buffalo, N. Y., the "Handbook of Modern Mechanical Power Transmission for Industry" is a graphic presentation of recent engineering procedure in designing and maintaining drives for efficient power transmission.

BLIND RIVETS The Cherry Rivet Co., Dept. 15, Los Angeles, Calif., has issued a 16-page handbook containing charts, diagrams, dimensional sketches and photographs, designed to aid men concerned with riveting operations on aircraft.

FURNACES Heat treating car hearth type furnaces are illustrated and described in 8-page bulletin No. 68-F, published by R-S Products Corp., Wayne Junction, Philadelphia, Pa.

HOISTS AND CRANES A maintenance folder prepared by Robbins & Myers, Inc., Hoist and Crane Division, Dept. M26, Springfield, Ohio, is de-



INDEXING ease and accuracy, extreme rigidity in locking are important superiorities of the McCrosky Turret Tool Post. It saves time, increases range and output of lathe work, and gives an engine lathe turret lathe advantages. McCrosky builds five styles of turrets, several sizes in each style, designed for two types of mounting—mounted in the T-slot of the compound rest or bolted to the bolt circle of the main slide. Illustrated above is McCrosky's Style "O" 4-Way turret mounted in the T-slot of the compound rest.

Full details in McCrosky Bulletin 16-E.

ANNOUNCING
New WAR MODELS by PIONEER

MODEL MVBD (shown above) and Models MVA and MVC – expressly designed to accommodate small sized machines, such as hand mills, surface grinders, internal grinders, etc. Because of their diminutive size, these midget models must not be confused with other pumps equipped with split phase motors.

MODEL VA–for uses in cases where submersion in coolant sump is more practical or less objectionable than the outside mounting would be.

MODEL VC–designed for external use–for situations where a tank cannot be utilized efficiently. Mounted with either vertical or horizontal bracket.

MODEL VBD–the only pump on the market arranged with 3 outlets to permit piping on either right or left side, or back into coolant sump through intake bracket.

SIX new Pioneer Coolant Pump Models, in several sizes, step into industry to help the war effort. Fittingly called War models, three of the models have been designed for all regular full sized applications, while the three midget sizes (exact counterparts of the large sizes) have been developed to provide the same fine quality for small applications.

All incorporate design changes which eliminate the use of critical materials. Their versatility of application permits a substantial reduction of your inventory, for each pump presents the possibility of many different applications.

The construction, styled in the modern streamlining, has been standardized to make quick delivery possible.

PIONEER PUMP AND MANUFACTURING COMPANY

19651 JOHN R STREET · DETROIT, MICHIGAN

signed to serve as a permanent file for hoist parts lists, diagrams and instruction sheets.

LATHES A 4-page, file-size bulletin, No. 1002, issued by the South Bend Lathe Works, South Bend, Ind., describes their turret lathes Nos. 1001-Z and 1002-Z.

LIGHTING How to care for fluorescent installations and get maximum lighting service is the subject of the booklet published by Sylvania Electric Products, Inc., Lighting Division, Salem, Mass., entitled "Timely Wartime Tips on Fluorescent Maintenance."

MOTORS Bulletin No. 210, describing their several types of electric motors, has been issued by The Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland, Ohio. The bulletin gives the range in voltage, speed and horsepower available.

PNEUMATIC DIE CUSHIONS The Dayton Rogers Mfg. Co., Minneapolis, Minn., has prepared a 28-page service manual which gives installation instructions for pneumatic die cushions.

PRECISION INSTRUMENTS Bulletin No. 43, issued by The American Gauge Co., 125 Bayard St., Dayton, Ohio, illustrates and describes thread checkers, hole checkers, amplifying gages, bench centers, radius dressers and lapping plates.

PRODUCTION A report entitled "Controlling Factory Production" has been issued by the Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y., in the interest of furthering war production and promoting employment stabilization within individual companies.

SAFETY The Boyer-Campbell Co., 6540 Antoine, Detroit, Mich., announces a catalog describing equipment and clothing for the protection of the working girl.

SUPERHEAT BURNERS A two-color, 8-page catalog, No. 251-B, "Superheat Burners, High-Speed Concentrated Heat Sources Fueled With Gas and Air Only," is issued by The Sales Co., Erie Ave. and D St., Philadelphia, Pa. Radical equipment for flame-hardening, flame-annealing, mechanized-brazing, preheating and other localized open heat treatments are introduced.

THREAD MILLING "Facts About Multiple Thread Milling Cutters" is the title of a 16-page bulletin, Form No. 1926, recently published by Barber-Colman Co., Rockford, Ill. Published to provide information helpful in ordering, making and using such cutters, this bulletin contains data useful to tool engineers and production supervisors responsible for thread milling operations.

TRANSFORMERS Power and distribution transformers and other electrical distribution equipment important in maintaining an efficient flow of power to vital war industries are described in Bulletin B-6186 issued by Allis-Chalmers Mfg. Co., Milwaukee, Wis.

WALL CHART For the convenience of engineering, production, designing and purchasing departments, The Weatherhead Co., Cleveland, Ohio, has published a handy wall chart which gives at a glance a complete catalog and identification system for various types of aviation fittings, hydraulic hose, valves, and other aviation accessories.

WELDING AND BRAZING The 100-page, illustrated booklet issued by the Aluminum Company of America, Pittsburgh, Pa., covering welding and brazing aluminum contains a section on gas, arc and electric-resistance welding, and one on preparing materials for brazing, furnace, torch and dip brazing, brazing castings and cleaning joints after brazing.

WIRING A 4-page booklet has been prepared by The Wiremold Co., Hartford, Conn., describing and illustrating industrial application of Wiremold #3000 System Wiring for plant light and power circuits.

NEW BOOKS

DICTIONARY OF SCIENCE AND TECHNOLOGY IN ENGLISH-FRENCH-GERMAN-SPANISH—*By Maxim Newmark, Brooklyn Technical High School. 386 pages. Published by the Philosophical Library, Inc., New York.* $6.

The 10,000 words contained in this attempt to produce an up-to-the-minute technical dictionary clearly show that this is a war product. Though the first word may still be the ancient "abacus," we do not have to proceed far before we run into such very modern terms as "air arm" and "air force," "air frame" and "air-raid warden." Continuing through the book, we find frequent examples such as "barrage balloon," "dive bomber," "firepower," "incendiary bomb," "lyddite," "pancake landing," "range finder," "Stuka," "zooming" and countless others.

As the author explains in his introduction, he has been at great pains to forestall the obsolescence that overtakes all technical dictionaries. He has based his work on the practices of current foreign periodicals and has checked his findings with material submitted by foreign representatives of the great American manufacturers. The result is a vocabulary like a daily paper's, not like a nineteenth-century novel's.

Despite the liberal sprinkling of such topical verbiage, the basic vocabulary

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"KNOW HOW TO SELECT THE PROPER TOOL . . .

Get 100% More Tap-Life!"

(No. 2 in a series of WOOD & SPENCER "KNOW HOW" Messages)

● Save time, material and labor . . . choose tools best suited to the job . . . insure quality results, fewer broken taps and longer tap-life. Remember, every saving in production time, every saving in material brings our Victory closer. To this end, we offer the following suggestions on tap use . . . apply them to your work; watch the results!

1. High-speed steel taps will tap more holes and break more easily at high speeds than at slow.

2. When tapping by hand, do not run the tap in a few turns, then back it up. Once started, go forward—there is much less chance of tap breakage, and better threads will result.

3. In cast iron, high-speed steel taps will do much more work than carbon-steel taps —and do it faster. High-speed steel taps resist the lapping action much better.

4. Be sure blind holes are drilled deep enough so taps cannot strike the bottom, or breakage will result.

Follow these rules—turn out high-quality work faster and with less waste . . . keep buying War Bonds. It's a combination the Axis can't beat! Write today . . . tell us your problems.

From customers' blueprints, we quite frequently make recommendations for

"THE RIGHT TAP AT THE RIGHT TIME"

The Wood & Spencer Company

Cleveland, Ohio

gain hours

Use Laminum shims to reduce parts machining for easier work tolerances in factory adjustment! More machine hours released for production.

Laminum shims (.003 or .002 inch precision laminations bonded into a solid unit) are cut to your specifications.

Stock shim materials obtainable from mill supply distributors. (Write us for sample and illustrated shim application chart.)

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is drawn from the common school sciences and such varied technical fields as pattern making, aeronautics, power generation, and meteorology among others. These words are given in both American and British form when the difference is more than a difference in spelling.

The body of the book gives the English words in alphabetical form followed by the foreign equivalents and a reference number. The French, German and Spanish forms are then given in separate indexes which locate the English word by the reference number. Each index is accompanied by a list of technical abbreviations for that language. In the pages between the vocabulary and the indexes, conversion tables for units of measurement are given.

•

TABLES OF DATA ON CHEMICAL COMPOSITIONS, PHYSICAL AND MECHANICAL PROPERTIES OF WROUGHT CORROSION-RESISTING AND HEAT-RESISTING CHROMIUM AND CHROMIUM-NICKEL STEELS—Prepared by *Russell Franks and Francis L. LaQue for the A.S.T.M. Committee A-10 on Iron Chromium, Iron-Chromium-Nickel, and Related Alloys. 43 pages. Published by the American Society for Testing Materials, Philadelphia.* $1.25.

These tables, published in December, 1942, have been developed by the A.S.T.M. with data contributed by a number of manufacturers and users of stainless steel. The first part pertains to wrought chromium steels 4 to 6 percent, 8 to 10 percent chromium, etc., while the second part covers wrought chromium-nickel steels up to 25 percent chromium, 20 percent nickel. All told there are 21 tables and 26 charts and curves covering such important data as chemical composition, physical properties, forging and heat-treating practices, and mechanical properties of steels. There is information on creep characteristics and short-time tensile properties.

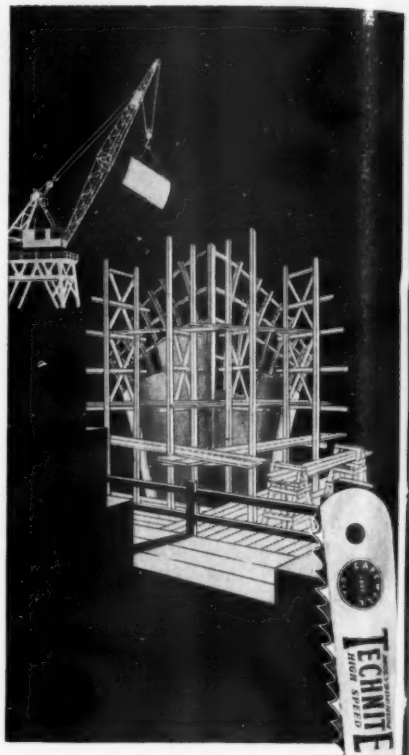
This publication is the third in the series on stainless steels issued through the Society. The first two were published in 1924 and in 1930.

•

FUNDAMENTALS OF ELECTRICITY—*Prepared by the Carnegie-Illinois Steel Corporation. 194 pages. Published by the American Book Company, New York.* $1.16.

The material prepared for teaching the basic facts of electricity to learners and apprentices of the Carnegie-Illinois Steel Corporation has now been presented in book form. The new volume has been rewritten to conform to the preinduction training course in fundamentals of electricity requested by the War Department.

Though designed for Army candidates, the material presented covers the field of electricity generally; its



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Free, New Handbook for Shop Men

To help you make hack saw blades and band saw blades cut more efficiently and last longer.

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civilian applications can be as wide as its military uses. Besides treating the theory of the subject from simple magnetism to mutual and self-induction and current rectification, the volume tells how modern electrical equipment is constructed and used. Among the devices covered are primary cells and storage batteries, motors, generators, lamps, meters, and rectifying equipment.

The information supplied is elementary but, for its level, thorough. No mathematics higher than simple algebra is required and the writing and illustrations are of the clearest. Each chapter is accompanied by study and review questions and at the end of the volume a list of demonstrations for laboratory use is given. The appendix also contains a number of appropriate tables.

•

MECHANICAL WORLD YEAR BOOK, 1943—*Published by Emmott & Co., Limited, Manchester, England.* 500 *pages.* 2/6.

The 1943 edition of this yearly reference book of British engineering practice has appeared despite the rigors of war. Besides the standard data contained in each issue, the current volume contains much new material to meet rapidly expanding mechanical methods. An entire new section has been devoted to the light metals, special attention being given to the wrought alloys. The section on press work has been revised, largely rewritten, and enlarged. Substitute practices brought about by war needs are treated in the "Selection and Substitution of Processes," which also contains information on die casting and plastics.

•

ELECTRICAL AND RADIO DICTIONARY—*Prepared by Carl H. Dunlap, chief engineer, Electrical Division, American School, and Enno R. Hahn, editor, Popular Mechanics Magazine. Revised edition.* 110 *pages. Published by American Technical Society, Chicago.* $1.

This small book of definitions is now in its eighth printing. It has been revised and enlarged, and to the original Dictionary of Electrical Terms, a Dictionary of Radio Terms and Definitions of Electronic Terms have been added. In the presentation, there is some duplication between the classes of words. For example, "aerial" appears in both the electrical and radio dictionaries. In the first it is "wires supported above ground and used for receiving or sending electrical waves." In the radio definition, it is "the elevated conductor portion of a condenser antenna." However, these duplications probably serve to point up the differences in usage between two closely related fields.

Besides definitions of words, the book contains several pages of illustrations of electrical symbols, including both the symbols for architectural plans and

W-S Standard Reamers with carbide tips. Tapered shank (illustrated) and straight shank types. Sizes: ¼ to 1½.

20% PRICE REDUCTION

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PRICES ON W-S STANDARD REAMERS are *now down* 20%! These new, lower prices are the direct result of our greatly increased volume on reamers and new production facilities. The majority of W-S reamer sizes is in stock most of the time. In addition, we keep numerous semi-finished shanks on hand for grinding to in-between sizes. Each W-S tool is genuine CARBOLOY tipped. *(Other brands may be specified.)* . . . Carbide tipped tools are not just a specialty with us . . . we make them *exclusively.* You can *expect* and *get* uniform, high quality results with W-S tools. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

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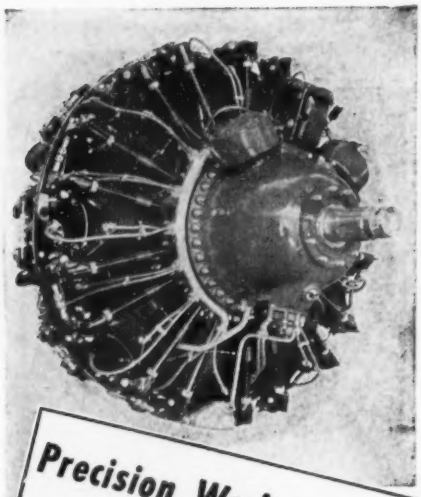

Precision Workmanship in a Great Engine

AMERICAN built planes are bringing the Axis nearer and nearer to the day of reckoning. Airplane engines like this are at the core of the drive. These great engines — power-houses of tremendous energy packed in a surprisingly small space — require the finest built parts fitted to close tolerances to perform their exacting tasks.

Many parts for planes and aircraft motors are produced in the Fenn plant, where skill and craftsmanship are devoted solely to war production tasks.

A capable engineering staff, directed by alert management, stands ready to help manufacturers with their production problems.

Fenn acts as prime contractor or sub-contractor on Special Machinery, parts and equipment. We welcome inquiries from those who need assistance in either development work or actual production.

FENN

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ESTABLISHED 1900

circuit diagrams and perspective drawings of the object. At the end of the book a number of formulas and handy tables are given. The book is attractively bound and printed in a handy small format.

•

X-RAYS IN RESEARCH AND INDUSTRY—*By H. Hirst, assistant director of metallurgical research, University of Melbourne. 129 pages. Published by Chemical Publishing Company, Inc., Brooklyn, N. Y.* $2.50

The subject matter of this small book is substantially the same as that of a series of lectures given before the Melbourne University Metallurgical Society from May through August, 1941. It is particularly concerned with physical metallurgy and the use of X-rays in research, but one chapter is devoted to industrial radiography.

The content of the book is indicated by the chapter titles, which are "Production of X-Rays," "Properties of X-Radiation," "Structure of Crystals," "Methods of Crystallographic Examination," "Application of X-Ray Methods," and "Industrial Radiography."

Though the material is presented in a scholarly, technical fashion, it suffers from the poor physical make-up of the book. The present edition has apparently been offset from a larger, earlier one. As a result, the type is very small and the illustrations have lost the clarity they originally had.

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1942 BOOK OF A.S.T.M. STANDARDS, *including Tentative Standards. Part I, Metals; Part II, Nonmetallic Materials—Constructional, Part III, Nonmetallic Materials—General. 4762 pages. Published by the American Society for Testing Materials. Philadelphia.* $9 *per volume.*

The 1942 edition of the Standards Book is now off the press. Published in three volumes, it contains in their latest approved form all of the society's specifications and tests for materials, definitions and recommended practices. This edition has 1090 specifications and standard methods which cover more than 4,700 pages.

Continuing the policy first used with the 1939 book, the latest edition gives all specifications, whether formal standards or tentative, as well as emergency alternate provisions. The divisions are as follows:

Part I, Metals—Ferrous and nonferrous metals (all A and B some E serial designations) except methods of chemical analysis. General testing methods (E serial designations).

Part II, Nonmetallic Materials—Constructional — Cementitious materials, concrete and aggregates, masonry building units, ceramics, pipe and tile, thermal insulating materials (all C serial designations). Timber and timber preservatives, paints, varnishes and lacquers, road materials, waterproofing and roofing materials, soils (certain D serial designations). General testing methods, thermometers (E serial designations).

Part III, Nonmetallic Materials—General—Fuels, petroleum products, electrical insulating materials, rubber, textiles, soaps and detergents, paper, plastics, water (remainder of D serial designations). General testing methods, thermometers (E serial designations).

Each part of the 1942 Book has a complete subject index. The Part II Index, for example, covers 32 pages, and there are two extensive tables of contents, the first lists all standards under general materials headings; the second lists them in order of the sequence of the serial designations. With the 1942 Book of Standards there is issued a complete 200 page Index to Standards. Supplements to each part will be issued in 1943 and 1944.

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INDUSTRIAL PRODUCTION ILLUSTRATION FOR STUDENTS, DRAFTSMEN AND ILLUSTRATORS—*By Randolph Philip Hoelscher, professor of general engineering drawing, University of Illinois, Clifford Harry Springer, associate professor of general engineering drawing, University of Illinois, and Richard F. Pohle, Major, U.S.A., chief of base shop data section, Rock Island Arsenal. 213 pages. Published by McGraw-Hill Book Company, 330 West 42 St., New York.* $3.50.

The increased use of pictorial illustration of production schemes in aircraft, shipbuilding and other wartime industries has created a need for draftsmen trained in perspective work. For this reason, the authors of this new book have prepared their material with a twofold aim. First, they have presented a comprehensive treatment of pictorial drawing from the standpoint of theory. Second, they have treated the practical methods of presenting ideas in industry.

The chapter titles give the content of the volume. They are: "Uses of Pictorial Drawing," "Lettering," "Orthographic Projection," "Orthographic Sketching," "Axonometric Projections," "Axonometric Sketching," "Oblique Projection and Oblique Sketching," "Perspective," "Engineering Delineation," and "Shading." Axonometric projection represents the first new synthesis in the theory of orthographic projection which has been made in many years, and this book contains the first formal presentation of the subject.

Full illustration is given each point. All techniques are presented in step-by-step drawings, as well as with actual illustrations drawn from industry. The line drawings are beautifully clear, but some of the halftones are grayed out so that details are indistinct. The book is spiral bound in heavy paper.

At the end of the volume several pages of problems are given, including 41 full-page plates.

SEEN and HEARD

By JOHN R. GODFREY

Round-Bottomed Threads

Ever since we began to build Rolls-Royce engines in this country we have had the problem of Whitworth threads as a handicap. No one was anxious to make Whitworth taps with the top and bottom of the threads rounded. Probably more balked at the rounded top than at the bottom.

No one questions the desirability of the round bottom on the thread in places where strength must be at a maximum and weight at a minimum, as in airplane construction. But as cracks start at the bottom of a thread and not at the top, why not leave the top flat as with the American standard? If, as occasionally happens, the thread must be pressure tight around the thread, the space between the flat top and the round bottom of the mating part can be filled with some of the plastic compounds. Such cases are, however, not at all common. The flat top would be perfectly satisfactory in the great majority of cases, and is much easier to make.

The tendency to use what may be called the "corrugated" or lamp base thread is not likely to extend to parts under stress, as the low angle of the side of the thread imposes a heavy bursting stress on the nut and a corresponding compressive stress on the bolt or screw. This form of thread would be more easily crushed into a grinding wheel than the regular Whitworth form, but its use appears to be limited to low stressed parts.

Making Things Too Good

One of the best proofs of the fallacy of that old slogan that "good enough" is never good enough came to light recently. The builder of a well known airplane engine wanted a small gadget to put on his engine. He found one in regular production in the Midwest and bought several at about $3.50 to try out. They worked perfectly and stood up well in service.

For regular production it was necessary to make these gadgets of aluminum instead of cast iron, which necessitated a bit of redesigning. So they gave one of the gadgets to a maker of airplane engine accessories who did a fearful and wonderful job. The original designer of the gadget wouldn't have recognized it. Fits that had been regular shop practice graduated into the ultra precision class with "tenths" all over the place. And the cost jumped from $3.50 to over $80.

Worst of all the ultra precision gadgets didn't stand up in service. They worked O.K. on the test stand but they froze up all to soon when the engines were on the job. And this "freezing-up" worked back until it wrecked some of the other apparatus

Need Gauges in a Hurry?

Here is how to order them for Fast Delivery

To insure fast delivery of Turner gauges we urgently suggest the use of the following information. This information will eliminate any oversight in listing specifications and save valuable time in unnecessary correspondence.

1 & 2 STANDARD PLUG AND RING GAUGES

(1) Diameter. (2) Length of gauging surfaces. (3) Tolerance or accuracy. (4) Hardened alloy steel or chrome. (5) No. of Members Go, Not Go, Handles (for plugs only). (6) Complete marking instructions. (7) Date that percentage of total order must be received.

3 SNAP GAUGES

Send complete specifications and blueprints and definite date order must be received.

4 FLUSH PIN

Send complete specifications and blueprints and definite date order must be received.

5 BUILD UP

Send complete specifications and blueprints and definite date order must be received.

ENGINEERS: In designing plug and ring gauges bear in mind that standard lengths will speed up the delivery of your gauges.

TURNER BROTHERS

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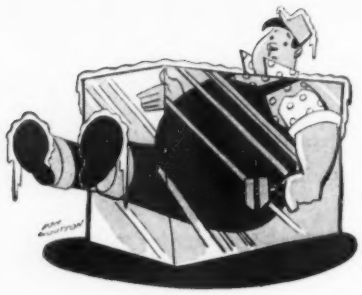
Send for this folder today!

This new Turner folder will give you information about Turner's line of precision built gauges.



FROZEN MAN POWER

Let's make it help win the war!

We have but one objective today — "Win the War."

We have but one reservoir of labor, not an inexhaustible supply.

That's why freezing of man power was resorted to.

But there is more than one cause for the "freeze" order—too many men were jumping their jobs; too many employers were pirating men from other essential industries, too few skilled workers were available; too few men and women to train; too much time taken to train them.

But more important than the "freeze" order itself, are the steps which management must take to meet it. Emphasis must be placed on the need for more production from the men and machines we have.

For our clients, now all in war work, Trundle Engineers have helped step up production through recommendations for better controls and by aiding in their installation. This means many controls: Labor controls; inventory and material controls; planning, scheduling and dispatching controls —all pointing to quality control and always keeping in mind that, "Labor is just as efficient as management plans for it and provides the tools with which to work."

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Consulting Management Engineering

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NEW YORK · Graybar Building · 420 Lexington Avenue

on the engine. The fits were "too good" when "good enough" would have been just right. And making things too good is just as poor designing and engineering as not making them good enough. Good engineering makes the design fit the needs at a minimum cost.

The Names of Things

Calling things by their right names isn't just a high brow fad—it's a time saver and also prevents costly mistakes at times. The exact name isn't as important as long as it means the same thing to everyone who hears or sees it. But "dingus" and "duhickey" are not very descriptive and may mean forty different things.

A lathe tool that cuts toward the lathe head, or to the left, is called a right hand tool. Many have tried to change it without success. So the committee gave up and let it go, because it means the same to every shop man.

"Helix" and "spiral" get all mixed up in the minds of many. In reality the only spirals we use in the shop are springs like the main spring of a clock or the scroll sometimes used in universal chucks. Most springs, screw threads, drills and reamers are helical. And here the reamer makers go off at tangent. Some helix angles they call helical and others spiral.

Another stumbling block is "fast" and "slow." We speak of a fast thread when it advances the nut rapidly. A 2-pitch thread is faster than a 10-pitch. Yet one drill maker calls his drills with a helix angle that would advance a nut rapidly a slow spiral, and a helix that would move a nut slowly a fast spiral. Both are very misleading. They are liable to cause delays by having the customer get the wrong drill and holding up his work.

Forged Gears

Years ago Oberlin Smith of the Ferracute Company complained, jokingly, of course, that the ancients had stolen many of his best ideas. Which is another way of saying that, confronted by similar problems the solutions are likely to be much the same.

What brings this to mind is the report that Timken has developed a method of forging gears complete with teeth so accurate (0.001 in.) that no finish or machining is necessary. This brings to mind the Anderson rolled gear, which started before World War I, when Anderson, then superintendent of the Speedwell Automobile Company, rolled gear teeth into lead blanks.

After the war, aided by Colonel Lewis of machine gun fame, Anderson established a plant in Cleveland and rolled a variety of gears for automobile replacements. The hot blank was rolled between master gears and produced a very creditable gear. He rolled both spur and bevel gears, among them a herringbone bevel which it would hardly be possible to produce in any other way. Anderson claimed commercial accuracy for these gears but

A lack of experience need not reduce inspection precision

It does require both skill and experience to handle close tolerance work on the time-honored fixed size gages—and skilled inspectors are scarce. But that need not interfere with precision in your plant.

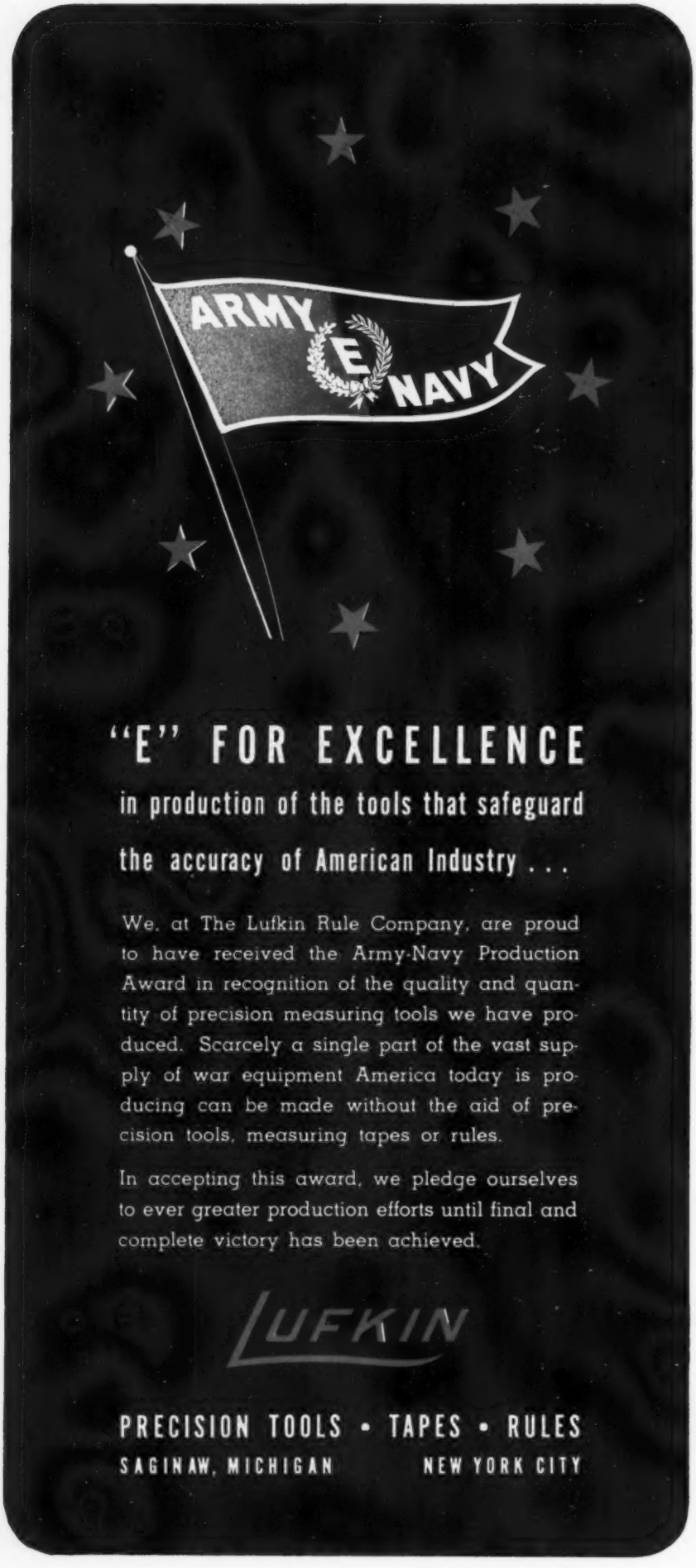
Substitute for the gages that require skill, the gaging instruments which give you greater precision and at the same time eliminate the human factor. Sheffield precision gaging instruments in the hands of inexperienced inspectors are guarding product quality in hundreds of plants today.

Write for descriptive folder No. 43-1.

THE **SHEFFIELD** CORPORATION

DAYTON, OHIO, U. S. A.

SHEFFIELD GAGES
MASTER GAGEMAKERS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in production of the tools that safeguard
the accuracy of American Industry . . .
We, at The Lufkin Rule Company, are proud to have received the Army-Navy Production Award in recognition of the quality and quantity of precision measuring tools we have produced. Scarcely a single part of the vast supply of war equipment America today is producing can be made without the aid of precision tools, measuring tapes or rules.
In accepting this award, we pledge ourselves to ever greater production efforts until final and complete victory has been achieved.
LUFKIN
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SAGINAW, MICHIGAN
NEW YORK CITY

the business did not prosper. Perhaps the time was not ripe for it. The process had the advantage of producing the desired grain flow and, when used to supply blanks for finish grinding, the teeth should still have possibilities unless master gear cost is too great.

Chrome Plating Scores Again

Chrome plating seems to be growing in importance. Plating cutting edges and wear surfaces of drills, taps, reamers and milling cutters is an old story but not used as much as it might be, even yet. One maker of standard gage blocks chrome plates each block when new, while others plate to bring them back to size. The same is being done with plug, ring and other gages.

Now the Army has found that chrome plating airplane cylinder bores to restore them to size, is very effective in salvaging them. They find that what they call "porous" plating is best as this makes minute "oil pockets." This is done by reversing the currents after the chrome is plated on the barrel and removing some of it. Then the barrel is honed and is ready for service. The regular chrome plating is too smooth and is difficult to lubricate.

This chrome plating of cylinders has been so successful that the Army wants more of it. Plants that can handle this work should be able to keep busy for the duration.

Round-Top Threads

Sir Joseph Whitworth designed better than he knew when he made the thread with a round top and bottom. Just why he picked 55 instead of 60 deg. for the thread angle is not clear, as 60 deg. seems to be such a natural angle. Nor do we see why he was so solicitous over strength at a time when metals were not stressed to their present limits. But if he had foreseen the airplane and its demand for lightness with strength he could hardly have designed a better form of thread.

According to reports there is a strong tendency toward adoption of the round top and bottom threads for airplane engines and accessories. It is even said that the usual 55-deg. form may give way to what might be called the "corrugated" form used on electric lamp bulb bases.

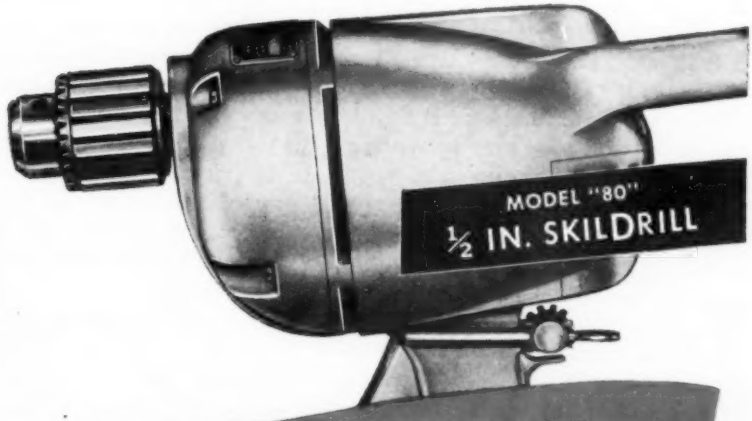
Opposition to the Whitworth thread has been mostly on account of the difficulty of machining it with ordinary methods. It is far from easy by usual single-point tools. But with the advent of the abrasive wheel formed by the crushing process, the problem is greatly simplified. This method of forming the faces of grinding wheels has been developed to what seems to be a successful conclusion. But it is evident that the corrugated form of thread can be more readily produced in the grinding wheel than the Whitworth, and this may be a real step forward.

SPEED UP ALL PRODUCTION DRILLING with these 3 SKILDRILLS!

The many other SKILSAW DRILLS give you a size and type for every drilling job!

● Everywhere SKILDRILLS are boosting War Production by boosting drilling output on every job! In aircraft plants SKILDRILLS speed up "skin-drilling" . . . on tank and engine assembly lines they "shoot holes" in drilling bottlenecks . . . throughout industry they're busy drilling *more holes in less time.* SKILDRILLS are light, compact, powerful . . . they get in tight places *easier* . . . go through tough metals *faster* . . . give you more drilling power and speed for every ounce of weight!

The features that make SKILDRILLS so superior are typical of the full line of SKILSAW DRILLS . . . a size and type for every job from fastest production drilling to heaviest boring and reaming. Ask your distributor to demonstrate SKILSAW DRILLS on your own work. . . today!



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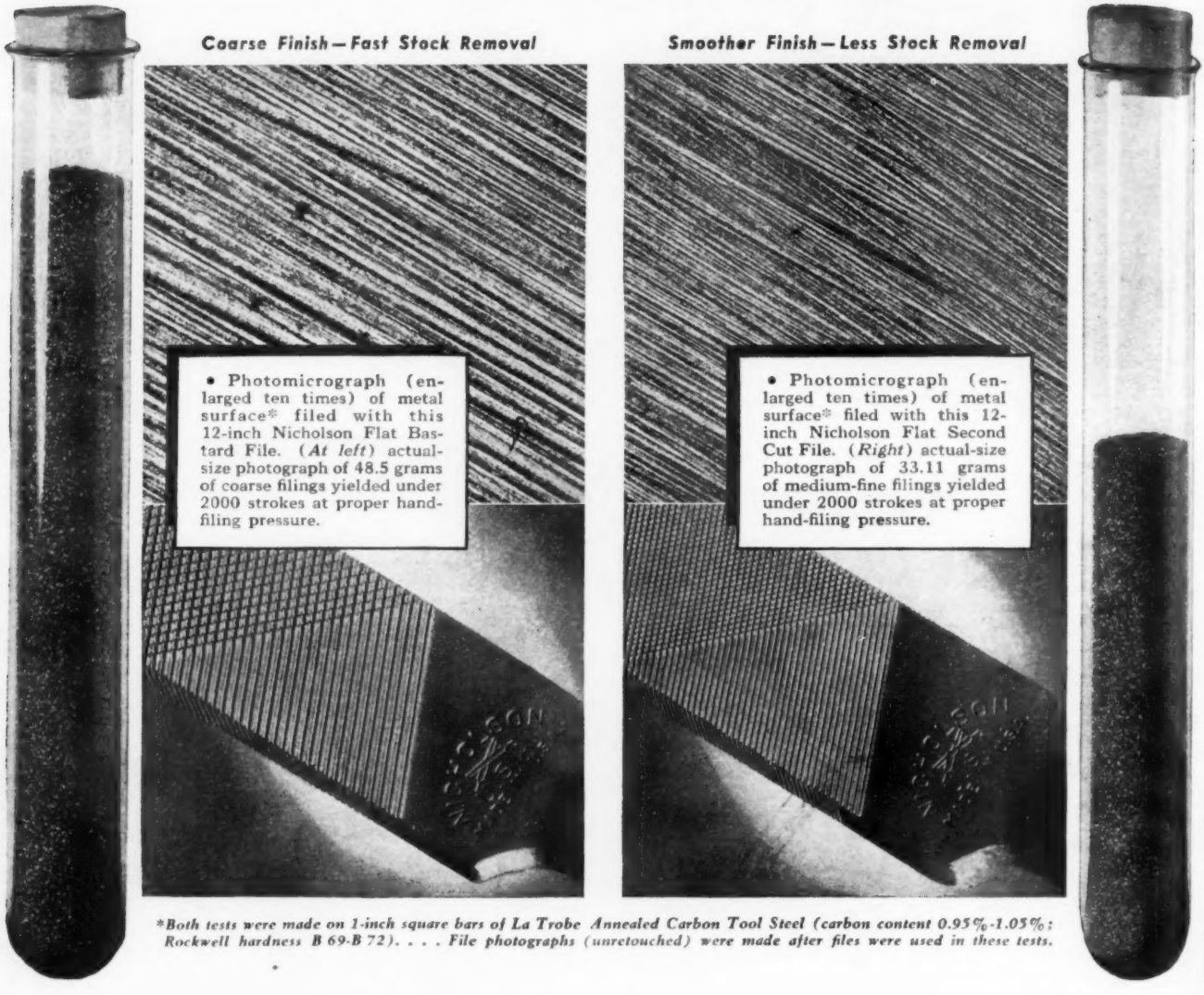
SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

"PHOTO FINISH" with a Big Difference


Coarse Finish—Fast Stock Removal
Smoother Finish—Less Stock Removal
• Photomicrograph (enlarged ten times) of metal surface* filed with this 12-inch Nicholson Flat Bastard File. (*At left*) actual-size photograph of 48.5 grams of coarse filings yielded under 2000 strokes at proper hand-filing pressure.
• Photomicrograph (enlarged ten times) of metal surface* filed with this 12-inch Nicholson Flat Second Cut File. (*Right*) actual-size photograph of 33.11 grams of medium-fine filings yielded under 2000 strokes at proper hand-filing pressure.

**Both tests were made on 1-inch square bars of La Trobe Annealed Carbon Tool Steel (carbon content 0.95%-1.05%; Rockwell hardness B 69-B 72). . . . File photographs (unretouched) were made after files were used in these tests.*

IN FILING production, skill is important. But the comparative tests photographically illustrated above show clearly that *The right file for the job* is highly important toward making that skill yield its utmost. (The wrong file wastes time, reduces efficiency, produces the wrong finish—and often spoils the work.)

These tests, among many made continually in the Nicholson test laboratory, show the work of two regular Nicholson Machinists' Files used under identical conditions by highly skilled mechanics. Similar tests with other types and cuts of files will reveal equally interesting comparisons.

Ask yourself, "What's the job and what's the metal; what's the finish and what's the time the job warrants?" Do they call for rapid stock removal—and much or little; for rough, medium or precision results?

If you have a filing problem that is particularly troublesome, send us a detailed description. Our engineering service will gladly undertake to *find* the answer for you.

And—if it's maximum production per *right file*, or per *file-dollar*, you seek, top-quality Nicholson or Black Diamond brands will fully reward your search. Consult your mill-supply house.

FREE REPRINTS

of this advertisement. Contains excellent instructive material toward training new workers. How many copies shall we send you?

FREE BOOK, "FILE FILOSOPHY" (48 pages). Among the many interesting facts and illustrations on files and filing, it covers notable differences in design and results between regular files and special-purpose files for Aluminum, Stainless Steel, Brass, Foundry Castings, Die Castings, Shear Tooth and Lathe filing. A valuable shop-school "textbook."

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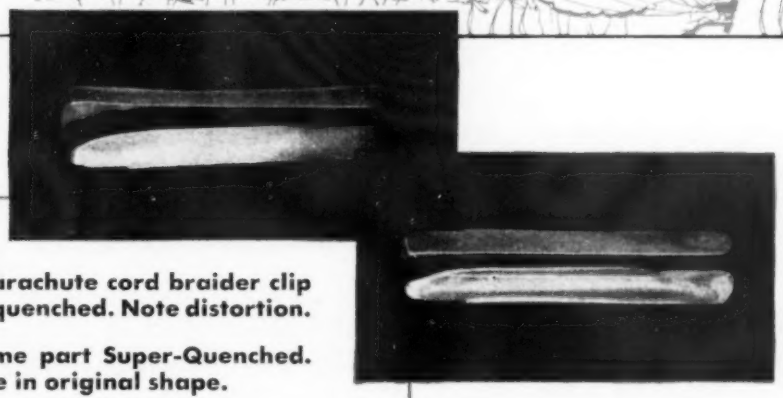
NICHOLSON FILES
FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U. S. A.

Another tough heat-treating problem solved with

Gulf Super-Quench



***Above*—Parachute cord braider clip as water-quenched. Note distortion.**

***Right*—Same part Super-Quenched. No change in original shape.**

Revolutionary new Quenching Oil gives parachute cord braider clip the necessary springiness without distortion, reduces rejections, increases production.

A manufacturer of machines for braiding parachute cords had difficulty in heat-treating the bobbin clip, one of the vital parts.

A water quench was too severe, causing such distortion that each clip had to be carefully straightened, which required the expenditure of hundreds of man hours each month. In spite of this, there were many rejections.

Conventional quenching oil would not give the necessary springiness in the clip. Consulted on the problem, a Gulf Service Engineer recommended Gulf Super-Quench, which achieved the necessary springiness without distortion. *Result: a substantial increase in production, rejections almost entirely eliminated.*

In plant after plant, this revolutionary new quenching oil is achieving remarkable results. Many parts for the weapons of our armed forces are being made harder and stronger with Gulf Super-Quench than was ever before possible with oil quenching. And yet Gulf Super-Quench avoids distortion and cracking.

Here's the important reason why Gulf Super-Quench is a superior quenching oil: It has *dual-action*—a faster cooling rate through the hardening temperature range, and the slow speed of conventional quenching oil below the hardening temperature range.

Gulf engineers are at your service in 30 states from Maine to New Mexico to consult with you on your quenching problems.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION · GULF REFINING COMPANY · PITTSBURGH, PA.

Mallory Tips and Holders Speed Spot Welding

Aircraft manufacturers have learned how resistance welding speeds production of fighting aircraft. The resistance welding art has made no small contribution to their incredible production records.

But the most modern welding machines and the most highly skilled operators could not set production records without the right electrodes and electrode holders.

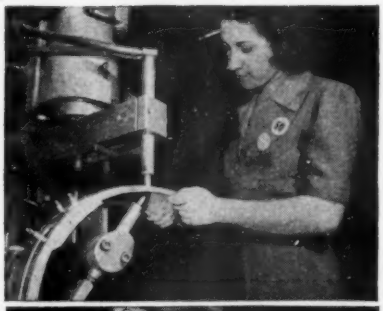
That is where Mallory comes in . . . Years of resistance welding experience have enabled Mallory to develop special electrode alloys, tip contours, holder designs and cooling methods that meet the most exacting demands of the aviation industry.

Mallory Electrodes for spot, seam and flash or butt welding do the job faster at lower cost. They insure less down time because they need redressing less frequently. They produce more welds per electrode, and assure sound, clean welds.

Mallory welding production and research facilities are at your service. Our engineers will be glad to help you . . . Mallory's helpful welding data book is yours for the asking. Consult us about your specific resistance welding problem.

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA

Cable Address—PELMALLO



PHOTOS COURTESY BELL AIRCRAFT CORP.

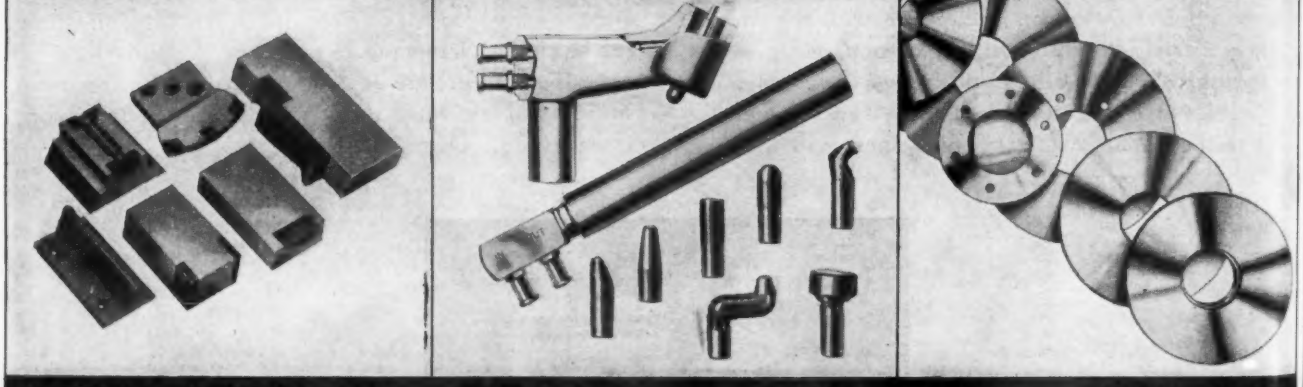
Welding Parts for Bell Army P-39 Airacobra

The Airacobra is a stout fighter. It is built that way. As its makers put it, "we set a cannon out in front, then build a fighter plane around it." Mallory tips and holders help mightily in speeding production on the Bell Airacobra.

P. R. MALLORY & CO. Inc.

MALLORY *Standardized Resistance Welding Electrodes*

FLASH, BUTT, PROJECTION WELDING DIES	SPOT WELDING TIPS AND HOLDERS	SEAM WELDING ROLLS



SPEEDIER PRODUCTION · LESS DOWN TIME · BETTER WELDING · LOWER COST

3 more war jobs Stepped up with Standard's new cutting fluids

Too hot to handle. On a cold nosing operation in the production of 90 mm. shells, friction in the die and the plastic flow of the metal generated excessive heat. With the stamping compound then being used, the shells came out of the dies smoking. Handling them was a problem.

A test of Stanostamp was arranged. With it, the shells could be touched with bare hands immediately after coming from the die, which greatly facilitated handling.

STANOSTAMP

Stanostamp is a time-tested product that has gone to war on many shell and shell-case operations. It reduces wear on dies and prevents sticking.

What's your problem? A Standard Cutting Oil Specialist has detailed information on many metal cutting and forming problems like this, both from his own experience in applying these new cutting fluids to war jobs and from the information relayed to him by the Standard Oil Technical Department. He has, or can get, the answer to any cutting oil problem you have. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Ill. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

OIL IS AMMUNITION . . . USE IT WISELY

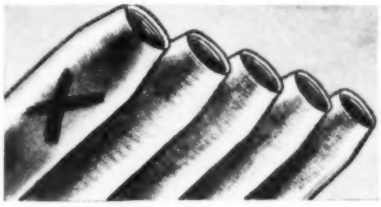
• New cutting fluids developed by Standard research men, and new applications of time-tested quality products by Standard Cutting Oil Specialists, are ironing out production kinks on all types of metal-forming jobs.

Do the typical examples below suggest a solution to any of your problems?

Heat-treated alloy gives cutters a beating. Milling wing struts of 4340 steel, with a Brinell hardness of 375, was one of the production bottlenecks in a western airplane plant. Cutters had to be ground after producing only 10 struts—frequently oftener. Among the cutting oils tested at this plant was Stanicut 155SC, recommended by a Standard Oil Engineer for this operation. Production immediately jumped to 25 struts per tool grind—a marked saving of both production time and tools.

STANICUT

Stanicut 155SC is one of a number of cutting oils Standard has developed recently. It is particularly designed for machining the tougher alloy steels. It contains the maximum amount of sulfur practicable to incorporate in a transparent oil—one reason for the longer tool life it gives.



Inspector says "No" once too often. Threading the nose of 90 mm. shells seemed to be a simple operation; but when a conventional soluble oil was used, the shells frequently failed to pass inspection because of rough threads. Too frequently, the manufacturer decided; and he turned the problem over to a Standard Cutting Oil Specialist. Another new product—Stanicool H. D. Soluble Oil—was put on this operation. Rejections became practically nil.

STANICOOL H. D.

Stanicool H. D. is a soluble oil to which special compounds have been added to reduce adhesion of the tool and chip. It not only gives better finish, but it also increases tool life on jobs requiring the extra cooling qualities of a soluble oil.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

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NEW Stanobar GREASE

It's a war-bred grease for ball and roller bearings

• ALREADY accepted as a veteran—while still a rookie—Stanobar Grease No. 2 is giving a splendid account of itself on wartime production lines. Today's swift pace demands this new type grease. Longer hours of operation alone call for a more stable grease to resist heat and oxidation, while the need for more frequent lubrication of bearings makes an easily handled gun grease an asset.

Stanobar brings you both these advantages. It's a smooth

(not fibrous) type grease that flows easily through grease guns. It contains inhibitors which reduce oxidation of both the soaps and oil in Stanobar. That means less cleaning of bearings, and less labor and lubricant required to flush out old grease.

Stanobar resists thinning out when worked—that helps reduce leakage. It may also enable you to replace two or three grades of grease you are now using with this one grade of Stanobar.

Let a Standard Lubrication Engineer explain some of the other advantages of new Stanobar—and help you make a test.

Check these advantages of New Stanobar Grease

... Easily handled in grease gun or pressure system.

... Resists thinning-out when worked.

... Does not oxidize and form deposits.

Today, Standard's Cutting Oil Service is more important to you than ever

Never in our history have product developments been more numerous and significant than those provided by our wartime cutting fluids. These developments have already answered some of the most difficult of the new machining problems. Tests now being made give promise of still other answers soon to come. Because many of these problems may be similar to those in your plant, you'll want to keep abreast of these improvements.

That's one place a Standard Cutting Oil Engineer can help you. He's familiar with the new products available. He can pass on the details of your problems to his Technical Department for the latest solutions.

This cutting oil service is available to all war production plants in the middle western states listed below. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the representative nearest you.

COLORADO • ILLINOIS • INDIANA • IOWA • KANSAS
MICHIGAN • MINNESOTA • MISSOURI • NORTH DAKOTA
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OIL IS AMMUNITION . . . USE IT WISELY

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

Simplify MOTOR CONTROL MAINTENANCE

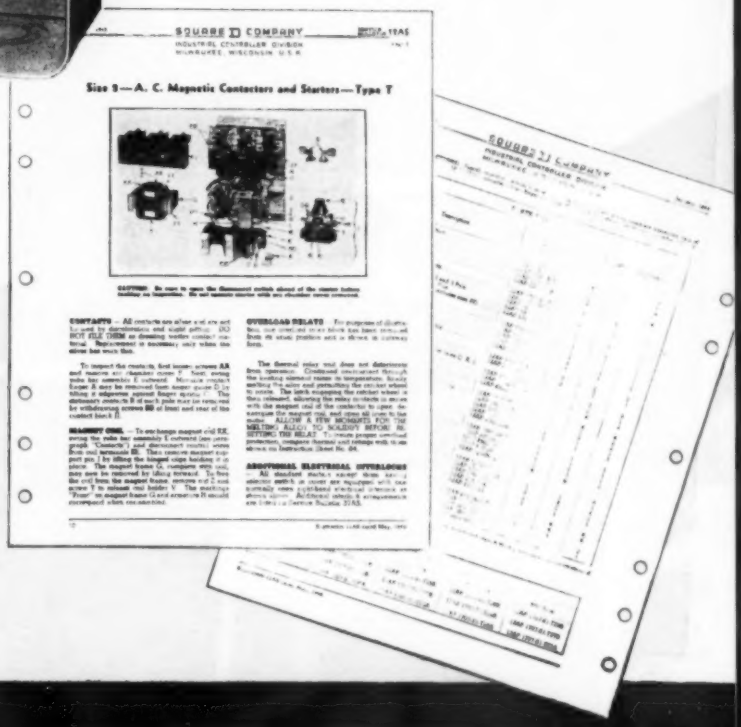
SQUARE D makes it easy by providing complete illustrated instructions with every starter

● Whether they're "old hands" or new on the job, men who do the electrical maintenance work like two things about Square D motor control.

First—simple, understandable servicing instructions are included with every starter.

Second—all renewable parts of Square D motor starters can be inspected or replaced, using only a screwdriver and without disturbing any external connections.

Both are important factors, especially during these days of all-out production. One eliminates guesswork. The other saves precious time.



● Top operating efficiency and long life of electric motor starters depend largely upon regular inspection and occasional servicing. For best results, follow the manufacturer's instructions.

Square D provides these instructions in the form of a "service bulletin." On the front of this bulletin appear the maintenance instructions and a partially "exploded" photograph of the starter with key letters and arrows to identify the parts. On the back is given the photograph key letter, description, catalog number and quantity required of each part. Complete ordering instructions are given, making it a simple matter to order replacement parts, if necessary.

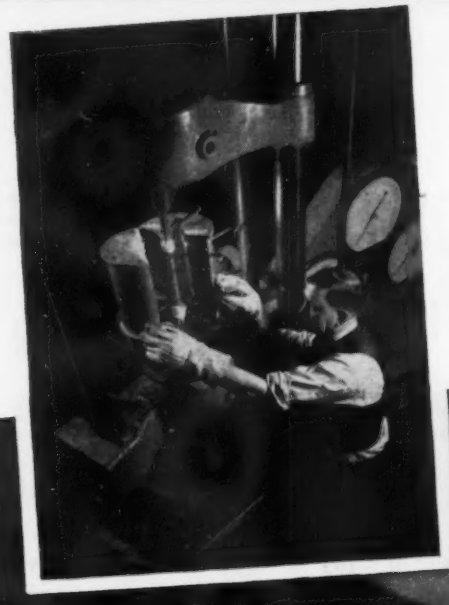
SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

THEY'RE FITTING STEELS



LS TO MEET THE GRIM NECESSITIES OF WAR

IT is to help *you* speed the war effort that the lights are burning late in our steel production and research laboratories. More than 1200 metallurgists and trained technicians are working here. Their most important job today is to adapt steels to the rigorous demands of war economy and war-time manufacture. They are on our payroll but they are working for you.

Largely from their knowledge and experience were born the National Emergency Steels that have made it possible to meet the critical conditions imposed by the shortages of nickel, chromium, molybdenum, vanadium and other strategic alloys. They have written new recipes for lean-alloy steels that provide the required qualities without excessive use of alloying elements. They've proved that you can substitute one alloy for another to achieve satisfactory results. They've made thousands of experiments that show not merely what these steels will do, but how you, who must use these steels, can fabricate and heat treat them to give the best results in service.

The mass of new technical knowledge these men have turned up is vitally important to you. We gladly place it at your disposal. Properly used it can be of real help in applying the steels now available, with greatest efficiency and least waste of time and labor. Only by taking advantage of America's war-stimulated research can this nation's overwhelming superiority in productive capacity be fully utilized.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

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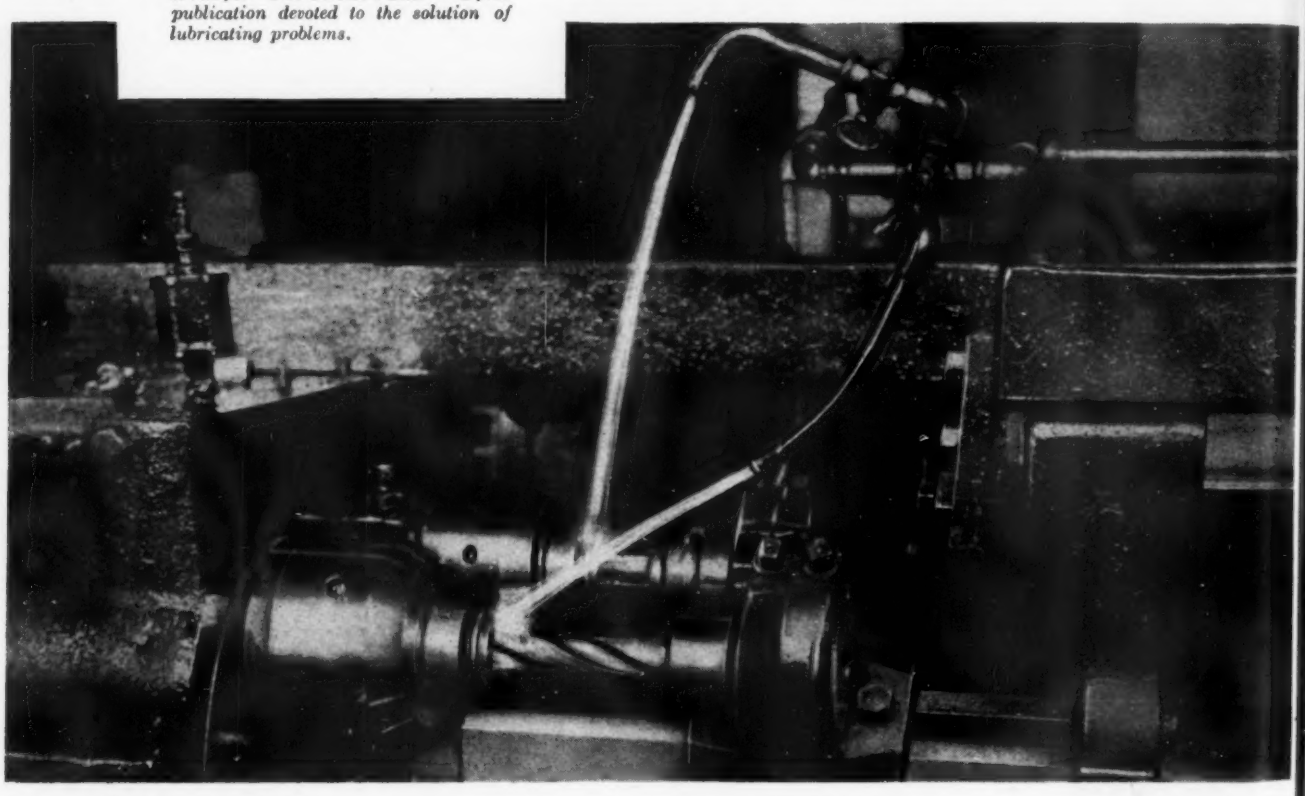
USS

UNITED STATES STEEL

STRIKING POWER abroad needs protective power at home. To maintain stepped-up operations in *MACHINING* use . . .

. . . SINCLAIR CUTTING OILS AND COOLANTS. These oils are made for precision work at all speeds. They promote cool operation, finer finish, and longer service periods between tool dressings.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



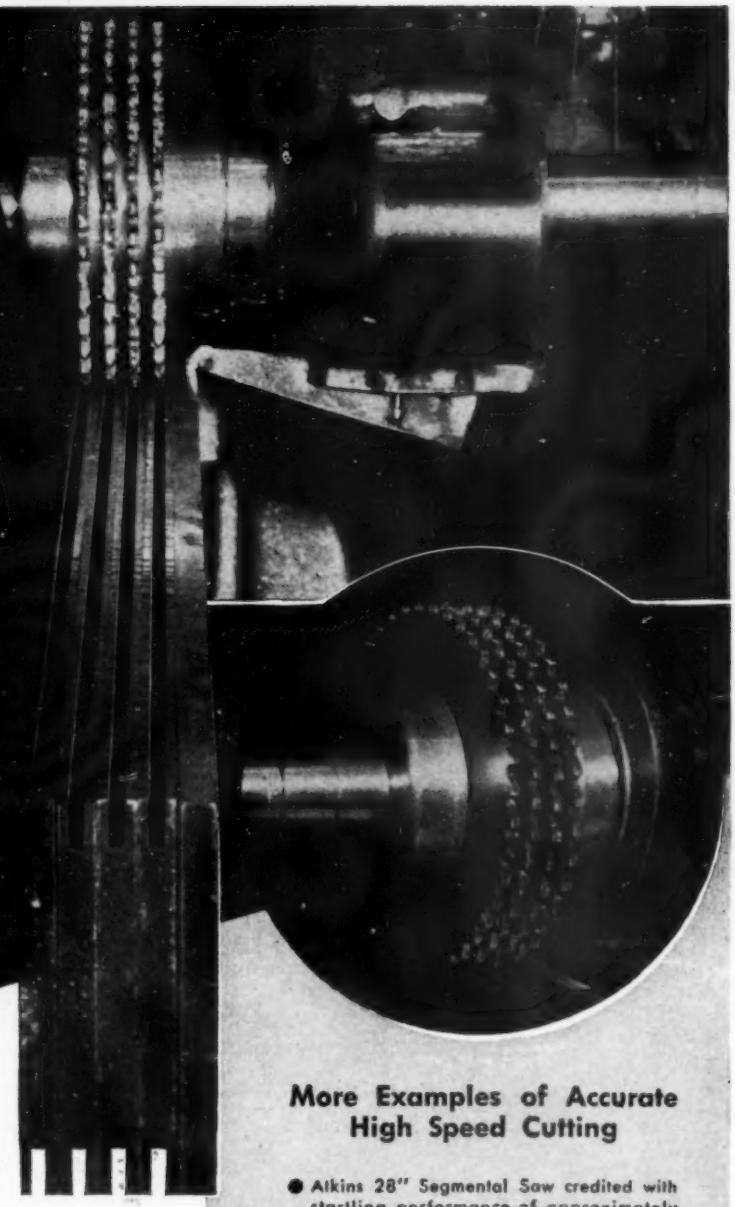
SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago • 10 West 51st Street, New York City • Rialto Bldg., Kansas City • 573 West Peachtree Street, Atlanta • Fair Building, Ft. Worth

ATKINS *Curled Chip* SAWS



Accurate Gang Sawing Speeds Production by Cutting 204" in 8 Hours

● Here is an example of high speed, accurate gang sawing you will recognize as way above average. Four Atkins Curled-Chip Milling Saws, operated in a gang as shown, were cutting ⅜-inch deep, ⅛-inch wide slots in steel plates. The saws were 5-inch diameter, operated at 32 RPM spindle speed, 42 FPM peripheral rim speed. The material cut was SAE 1090 22 Rockwell (and that's plenty hard). Yet these saws cut at the rate of 204" in 8 hours—a truly remarkable record, on work requiring utmost cutting accuracy.

Our file of performance data on the great cutting capacity and long cutting life of Atkins Curled-Chip Saws is growing daily. It offers convincing proof that the Atkins Curled-Chip System (including Milling Saws, Segmental Saws, Powersaw Blades and Band Saws) is today's most practical way of getting work out fast and efficiently. Write for these data today.

More Examples of Accurate High Speed Cutting

- Atkins 28" Segmental Saw credited with startling performance of approximately *7 seconds the cut* on 8" Round Bronze Billets.
- **650% More Production**—Sawing 40 mm. burr-free shell bands at 1 each second with an 8" Curled-Chip Saw instead of 4 every 30 seconds on a screw machine.
- 860 Brass Slabs, 15½" x 4½", 59,985 sq. in. *cut between sharpenings* by Atkins 30" Segmental Saw.
- Atkins 28" Segmental Saw records *27 seconds per cut* on 77 mm. stock.
- **Production 45 Times Faster**—A whirlwind reduction in cutting time on 2½" Electric Cast Steel—7½ minutes to 10 seconds is the achievement of Atkins new 6" Curled-Chip Milling Saw.

E. C. ATKINS and COMPANY 424 S. Illinois Street, Indianapolis, Indiana

DOES ONE "Absentee Part" RETARD YOUR PRODUCTION?

"X" MARKS THE SPOT
THAT BLOCKS PRODUCTION!

ARE schedules missed because one difficult *part* is hard to get? Do inspection rejections unbalance your production line because one *part* fails to meet quality standards? Does your war production suffer . . . is progress retarded on your new post-war product plans . . . because of "absentee parts"?

Contact KAYDON

High precision production of difficult parts . . . coordinating part design and production methods to speed output, improve utility, or lower costs . . . assuring "on time" deliveries to avoid "absenteeism" of parts . . . these are services the Kaydon organization offers, based on a sound background of engineering and precision manufacturing experience.

For excellence in production of extremely precise, unusually large ball and roller bearings.

THE KAYDON ENGINEERING CORP.

McCRACKEN STREET • MUSKEGON, MICH.

Specialists in Difficult Manufacturing

SHOOTING enemy aircraft out of the sky . . . with all guns blazing . . . this fighter plane uses up shells at an astounding rate.

In achieving an all-time high output of shells, not only for planes, but for guns on the ground and aboard ship, war plants everywhere are making use of *Texaco Cutting Oils.*

Texaco Cutting Oils, including *Cleartex, Sultex* and *Transultex,* lubricate the tools, prevent chip welding by carrying away the heat, assure improved surface finish, and maximum output per tool grind.

So effective have Texaco Lubricants proved that they are definitely preferred in many important fields, a few of which are listed in the panel.

A Texaco Engineer specializing in cutting coolants will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 E. 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.

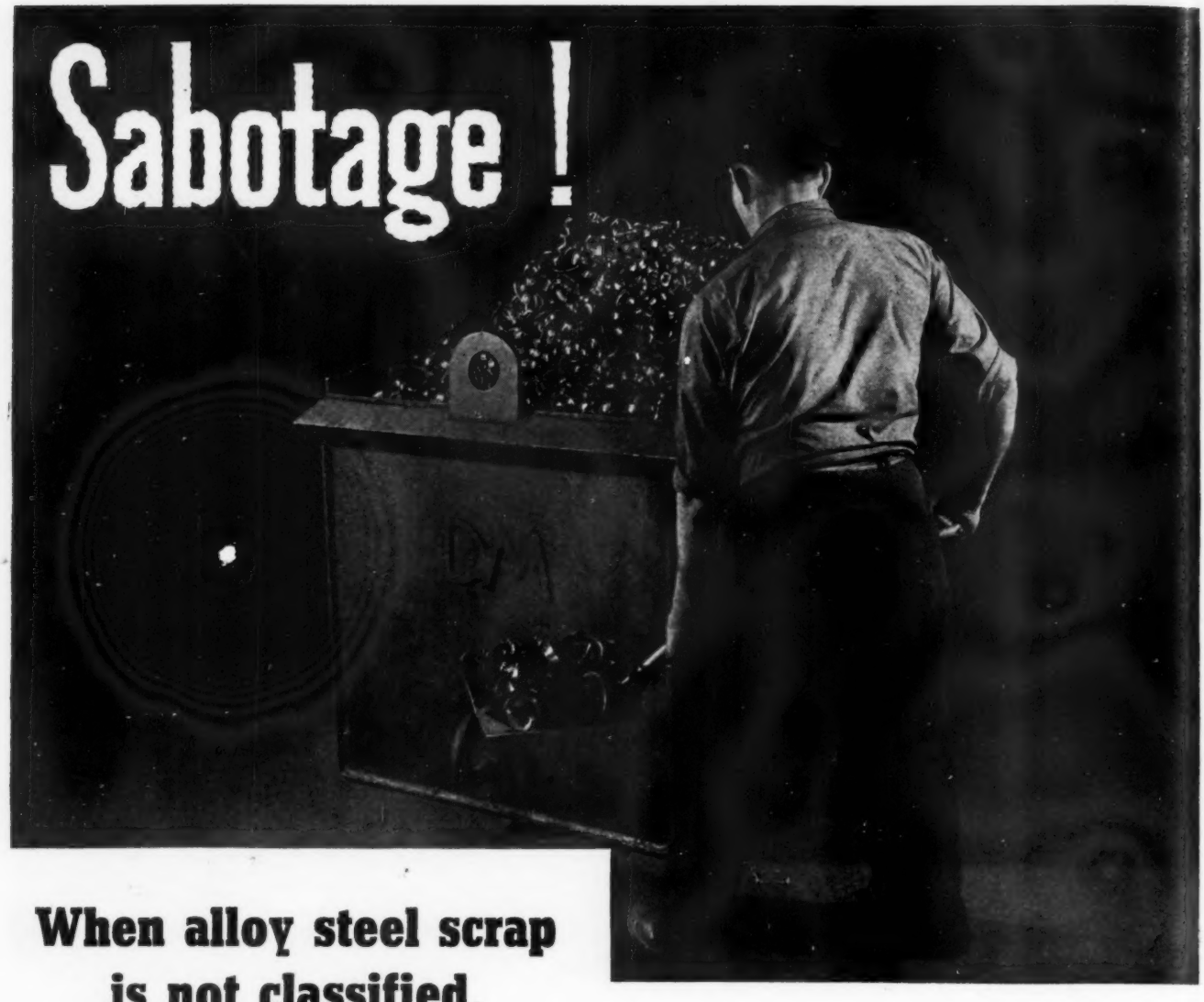
★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

TEXACO

TEXACO Cutting and Soluble Oils

FOR FASTER MACHINING

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY



When alloy steel scrap is not classified, critical alloying metals are lost to the war effort

Where alloys are concerned it isn't enough to sweep up turnings, flashings and other scrap and start it back to the steel mills.

When different grades of alloy scrap are flung together, or alloy and common scrap thrown on the same pile, the content of alloying metals, so critical in this alloy-steel war, is sunk without trace. The precious alloys are lost as completely as if they were dumped into the sea.

To help feed hungry furnaces and make more fighting alloy steels, alloy scrap must be classified, right at the spot where it is produced. It is so critical that we cannot afford to waste a pound of it. *One-half of this country's alloy-steel output depends on the availability, and therefore the proper classification, of alloy scrap.*

When alloy scrap gets "lost" it remains lost, for the man-hours that would be needed to pick over and check every shipment simply cannot be spared. And when hidden alloys contaminate steels made to meet certain physical specifications, entire heats may be ruined.

No one knows better than the steel-maker that painstaking classification of alloy scrap is no simple thing, takes patient organization. But it is a job worth doing, and one that can and must be done. There is no other way to make sure that every pound of critical alloying metals in the nation's scrap supply is tagged and made available to do its part in winning the war.

BETHLEHEM STEEL

Our government has issued a classification list showing how alloy steel scrap should be segregated. If you haven't it, and would like to receive a copy, let us send you one. Write to Bethlehem Steel Company, Bethlehem, Pa.

Save Metal

Usable FROM END to END No WASTE or SCRAP

to Save AMERICA

Compare . . . .

The pile of turnings shown in the center is the amount of metal lost when you buy Rough Bronze. Why not start today to prevent this waste?

◆Every time you purchase rough bronze bars, you buy 25% more metal than necessary. You spend valuable time machining the bars . . . lose the excess metal . . . and have no guarantee that the finished product will be free from undersurface defects.

When you purchase Johnson UNIVERSAL Bronze you prevent this waste. Every Johnson UNIVERSAL Bronze Bar is completely machined—Inside Diameter —Outside Diameter and Ends. It is entirely usable from end to end.

The next time you need BRONZE . . . specify Johnson UNIVERSAL. Check the money, metal and time saving features. From our list of over 350 stock sizes . . . you can buy strictly according to your needs.

Why not start NOW . . . to save metal.

JOHNSON BRONZE

SLEEVE BEARING HEADQUARTERS

The MOST COMPLETE SLEEVE BEARING SERVICE in the WORLD

515 S. MILL STREET NEW CASTLE, PA.

Give every machine operator an ex

One of the biggest advantages of W·A·B Remote Control Systems today is the way they help solve man-power problems.

They are making it unnecessary for skill to be combined with muscle for machine operation. They let a man control distant equipment with the touch of a lever, instead of by shouting his commands at someone else.

In graduating controls, the slightest movement of the lever produces a precise corresponding movement of the operating mechanism. There is no lost motion or overrun, and accuracy is not impaired with usage. The force exerted can be exactly balanced to the load.

Where a cycle of operations is involved, any fixed order can be established. The timing of the steps is at the will of the operator, but the sequence cannot be varied through ignorance or carelessness.

Where safety or limiting devices are desirable, they can generally be directly interlocked. Their action is direct and positive, and no complex auxiliary equipment is needed.

W·A·B Remote Control Systems are now successfully operating on ships, on earth moving machinery, on mining apparatus, drilling rigs, cranes, conveyors, factory equipment, and in dozens of other applications.

Their almost limitless possibilities cannot be defined by any list of current uses. You can tell, better than anyone else, where W·A·B Remote Control Systems—Pneumatic, Pneumatic-Electric, or Pneumatic-Hydraulic — might fit into your plant or your product. In many instances, users' problems have been completely solved with standard "off the shelf" W·A·B devices.

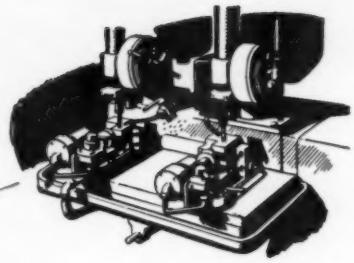
Our representatives will be glad to cooperate with you, in developing a system engineered to your individual needs. Phone, wire or write.

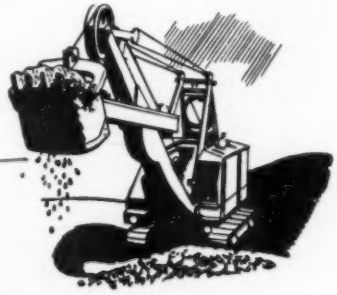
Westinghouse Air Brake Company

INDUSTRIAL DIVISION

General Offices: Wilmerding, Pa.

74 Years of Pneumatic Control Experience



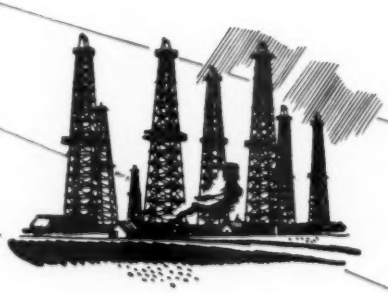


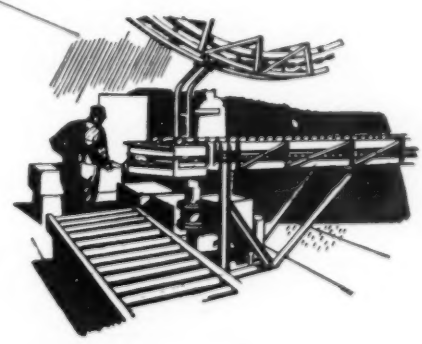
an extra hand.. and a longer reach

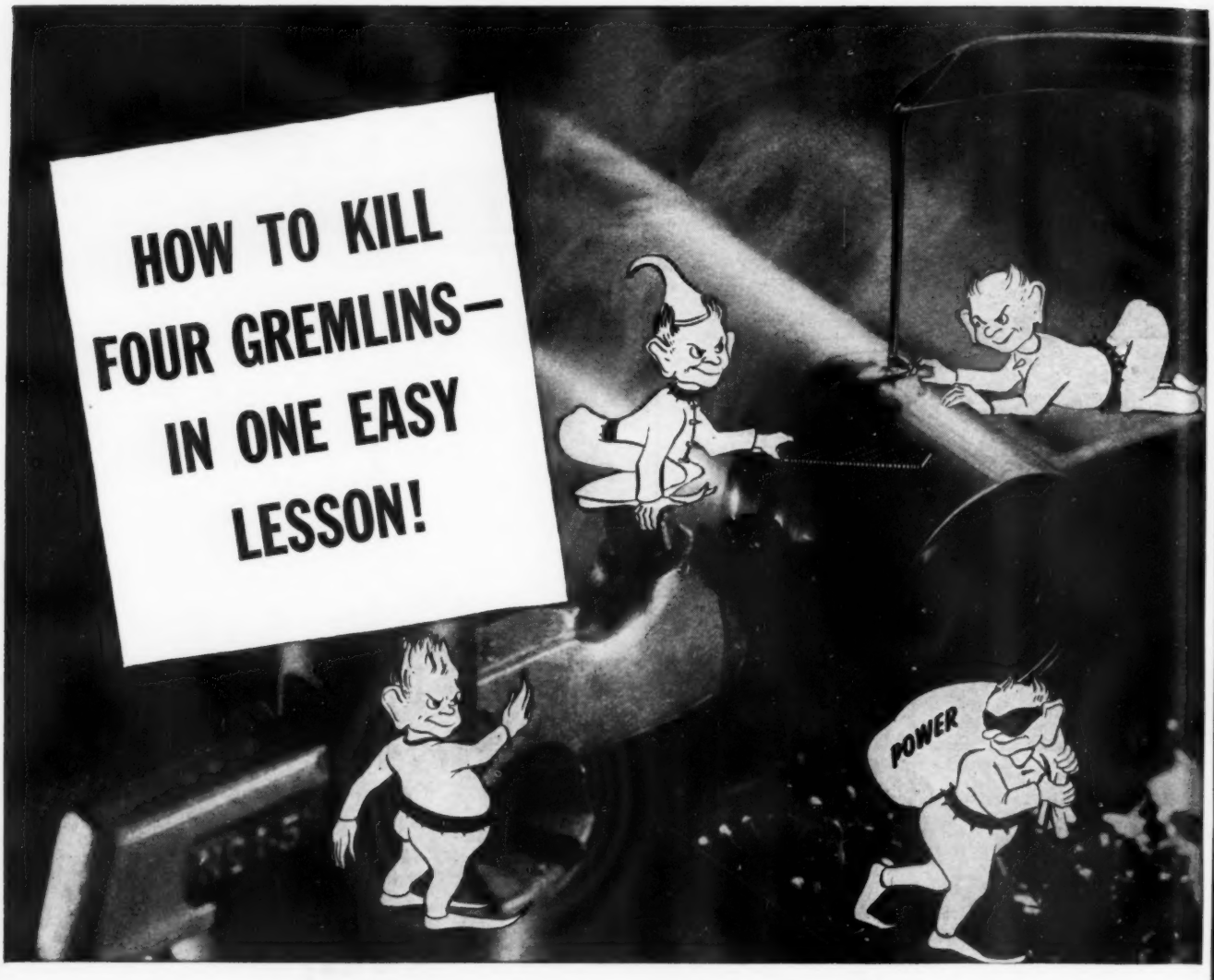
W·A·B

PNEUMATIC
PNEUMATIC-ELECTRIC
PNEUMATIC-HYDRAULIC

Remote Control Systems







There's a quartet of gremlins with a particular fondness for cutting tools. Their names are Friction, Heat, Power Thief and Tool Wear. Anyone of them can stall production.

There's an easy way to help kill 'em off . . . and to keep them from coming back again.

Simply specify Chillo Cutting Oils. These famous Cities Service coolants deliver speed, fine finish, and longer tool life. They are particularly appropriate now, for they were especially designed to fit the most exacting requirements of wartime production.

Get in touch with your nearest Cities Service office today. A Cities Service lubrication engineer will confer with you on the needs of your particular machining operations. No obligation, of course.

For a free, informative booklet on Metal Machining Fluids write to Room 1379, Sixty Wall Tower, New York, N. Y.

MAUMELLE ORDNANCE WORKS
CITIES SERVICE DEFENSE CORPORATION

CITIES SERVICE OIL COMPANY
NEW YORK · CHICAGO

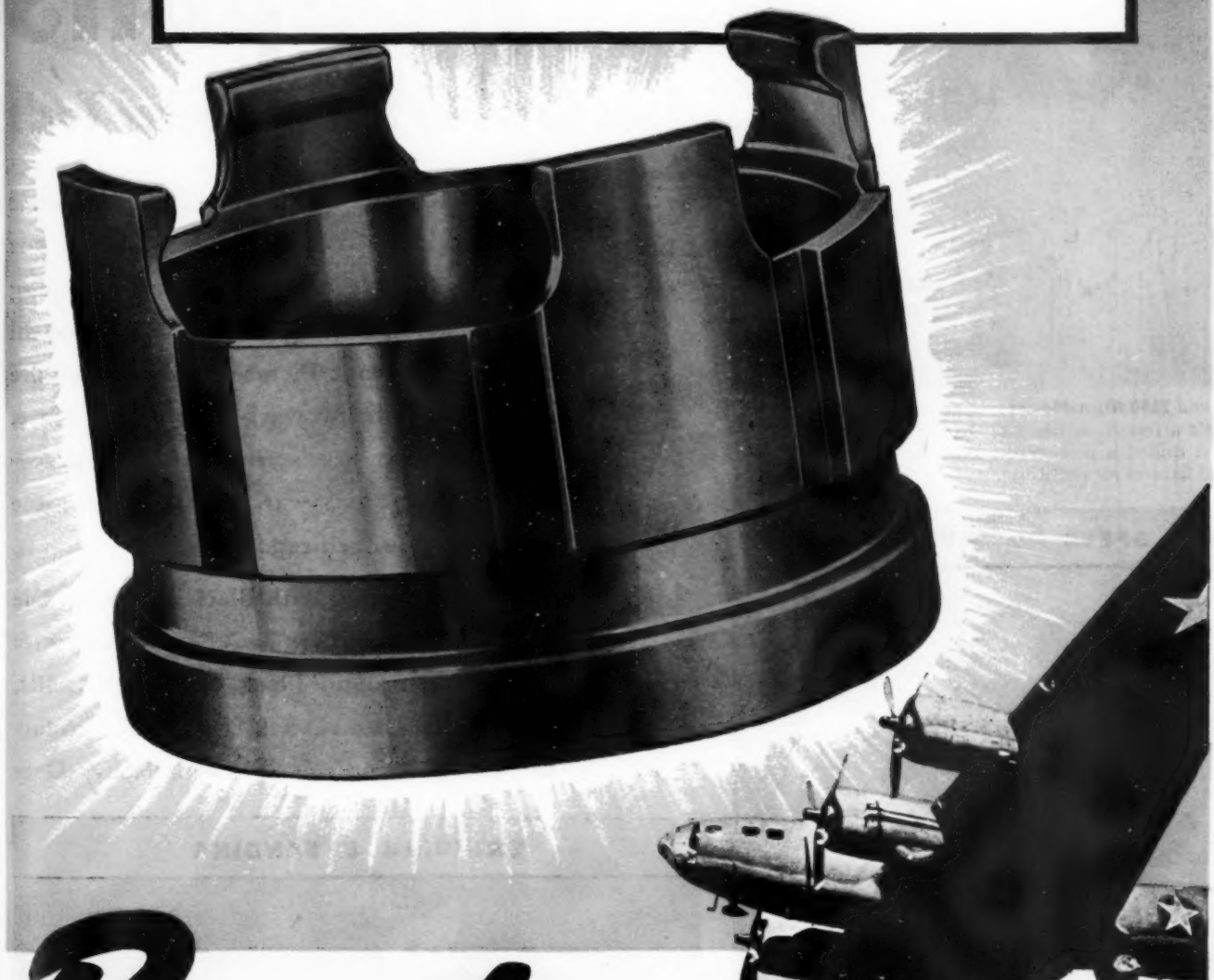
IN THE SOUTH
ARKANSAS FUEL OIL COMPANY
SHREVEPORT, LA.

★ ★ OIL IS AMMUNITION — USE IT WISELY! ★ ★

13 Ounces of Precision Bronze

Whirling within this 13 ounce Bunting Bronze Bearing is the propeller shaft of the 2000 H.P. aircraft engine that powers this country's fastest, most powerful planes.

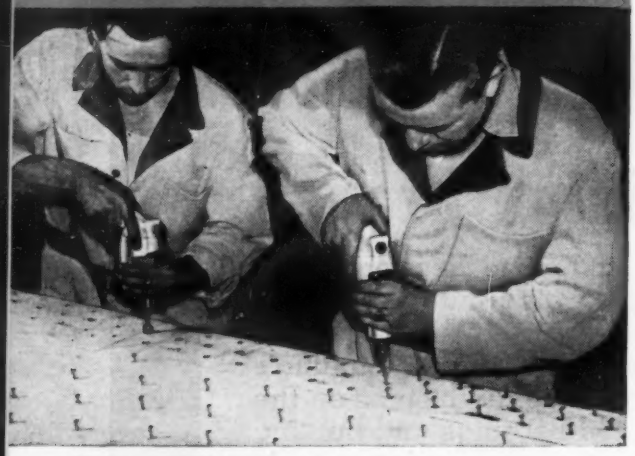
Also geared to the nation's Victory Program is Bunting's Bronze Bearing Service for the war production industries on the home front. Bunting Bronze Standardized Bearings and Bunting Factory-Finished Bearing Bronze Bars, available from stock, save time, labor, metal in production and maintenance of machine tools, electric motors and all kinds of industrial machinery. Ask your wholesaler. Write for catalog. . . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.



Bunting

BRONZE BUSHINGS • BEARINGS • PRECISION BRONZE BARS

DRILLING & SCREW DRIVING



Holgun and Scrugun—a perfect high-speed production team for turning out PT Boats. They're used for thousands of drilling, countersinking and screw driving operations on the hull of each boat.

HAMMERING IN CONCRETE

"Saved 2100 Man-Hours on this war housing project." That's a report on Black & Decker Electric Hammers—which drilled a half-million holes in concrete to fasten metal fixtures for partitions.

HIGH SPEED NUT RUNNING

A Time Saving of 73% resulted when Black & Decker Nut Runners tackled the job of assembling gas mask parts. Nut running time was cut from 15 to 4 seconds per unit. Production increased 250%.

Smoothing Rough Castings like this for heavy marine use, and sanding the sleek hulls of Uncle Sam's mosquito fleet, are among the many wartime uses of B & D Portable Sanders and Grinders.

"Peacetime" Tools Now Weapons

Time Saved by Black & Decker Tools

BLACK & DECKER Portable Electric Tools—used by peacetime industry for decades, now are "weapons of war"—helping speed the output of fighting equipment on all production fronts. Pictured on this page are a few of the many ways in which Black & Decker Tools are saving precious time—WAR time. From war plants all over the country come such reports as:

"60% time saving with Black & Decker Die Grinders and Sanders" . . . "Built our entire production around Black & Decker Drills, Screw Drivers and Quick-Saws" . . . "Production up 60% on one job with Heavy Duty

GRINDING & SANDING

# of War!

helps Win Battle of Production

Drill" . . . "Time saving of 60% with Black & Decker Bench Grinder" . . . "Sheet metal cutting 75% faster with Black & Decker Lectro-Shears" . . . "Thank you for the assistance in setting up our new production line."

Reports like these present a clear picture of American free enterprise in action . . . of close cooperation between war producer and tool supplier . . . of free men pooling their ingenuity and efforts to turn out "what it takes" to win this war.

If you want Expert Help

Phone your nearby B & D Distributor if you want expert help on any tooling problem you may have. He's your dependable, convenient source of supply and tool information. The Black & Decker Mfg. Co., 716 Pennsylvania Ave., Towson, Maryland.

ARMY E NAVY

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

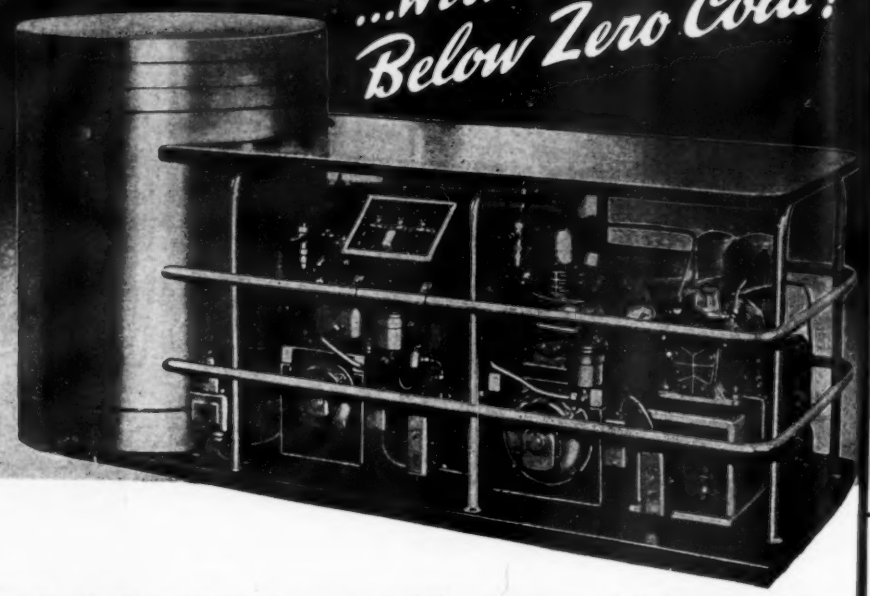
PORTABLE ELECTRIC TOOLS

Countless hours

are saved in aircraft plants, where Black & Decker Drills bore millions of holes in metals, wood and plastics. Here's a ½" Heavy Duty Drill boring beams of shipping crates, to carry fuselages overseas.

How Metal Shrinking Eliminates Bearing Spoilage

...with this 120° Below Zero Cold!



NO POUNDING OF BEARINGS INTO PLACE . . . WITH *Expansion-Fit* ASSEMBLY

ANOTHER MONEY-SAVING DEEPFREEZE APPLICATION

Tapered Roller Bearing-Race Assembly Time Cut to One-half Minute

This manufacturer uses a Deepfreeze Industrial Chilling Machine to shrink steel tapered roller bearing races for insertion in a casting. Time was cut to ½ minute per piece in contrast to former method of using dry ice and kerosene requiring ½ hour to cool kerosene. Deepfreeze eliminated the inconvenience of obtaining the dry ice and the use of kerosene which caused a slush.

SAVINGS

Dry ice method was costly. Used 50 pounds every 3 days with considerable waste. Deepfreeze eliminated cost of dry ice, kerosene, and the cost of delays waiting for delivery.

DATA AND PART INFORMATION

PARTS—Tapered Roller Bearing Races.
MATERIAL—Steel.
SIZE—Bearing Cups 4¼" diameter.
OPERATION—Permanent Expansion-Fit Assembly.
AMOUNT OF SHRINK—(Male Part) .003" in a Deepfreeze Chilling Machine.
TIME—½ minute each.

WHAT'S YOUR METAL-CHILLING PROBLEM?

Deepfreeze engineers are available to assist you with your metal chilling prob-

Now it is possible with Deepfreeze metal chilling equipment to eliminate the spoilage of expensive bearings caused by unnecessary pounding while assembling. Shrinking of metal at −100° F. to −120° F. with Deepfreeze equipment has made it possible to assemble sleeve bearings, and ball or roller races otherwise requiring a press fit, by merely slipping them into position after chilling. This expansion-fit application usually involves the chilling of the inserted part only, although some practices call for heating the female part slightly and chilling the mating section. In most cases it is possible to insert the male part by hand with a tight fit resulting as soon as the part has returned to room temperature.

4 Other Ways DEEPFREEZE CAN HELP YOU:

- **1—TREATMENT OF TOOL STEEL**—Metal chilling at −100° F. to −120° F. can be used for the "conditioning" of steel to produce combinations of hardness, strength, and ductility unobtainable by ordinary hardening and tempering.
- **2—SEASONING GAUGES, ETC.**—Metal chilling is used by tool and gauge manufacturers to insure dimensional stabilizing of the steel to prevent excessive expansion of the parts due to minor variations in temperature.
- **3—CHILLING ALUMINUM RIVETS**—Storing and chilling annealed aluminum alloy rivets retard age hardening. Rivets stored at −50° F. remain soft enough for driving for two or more weeks.
- **4—TESTING OF METAL AND OTHER MATERIALS**—Deepfreeze sub-zero temperatures are used for the testing of aircraft instruments and materials to study the reactions of vital equipment to stratosphere flying.

FREE BULLETIN describing Deepfreeze Units with complete details and specifications, and listing other uses. Send for copy today.

Deepfreeze
DIVISION

MOTOR PRODUCTS CORPORATION
2327 DAVIS ST., NORTH CHICAGO, ILLINOIS

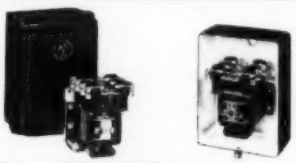
CHECK LIST OF INDUSTRIAL MOTOR CONTROLS

Bulletin 709 Starters in Five Sizes

From the complete line of Allen-Bradley trouble-free motor controls, you can always find the right combination of standard units to meet any special industrial requirement. Our control engineers will gladly help you with your problems. Write for any bulletin listed below.

3 Of the 9 Standard Enclosures

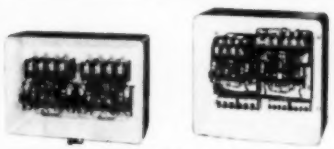
Bulletin 353 Small Drum Switches



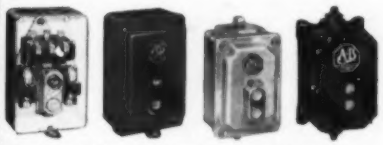
Bulletin 700-200 Solenoid Contactors

Bulletin 640 and 740 Semi-Automatic and Automatic Resistance Starters

Bulletin 375-385 Drum Switches

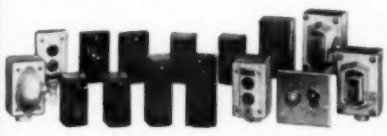


Bulletin 715 Multi-speed Starters



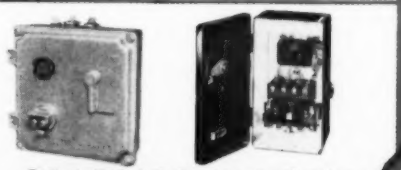
Bulletin 609 A-C Hand Operated Starters

Bulletin 705 Reversing Switches



Bulletin 800 Push Buttons and Selectors

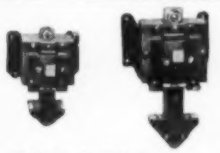
Bulletin 600 Manual Starting Switches



Bulletin 712 A-C Combination Starters

Bulletin 801-802 Limit Switches

Bulletin 836 Pressure and Temp. Controls



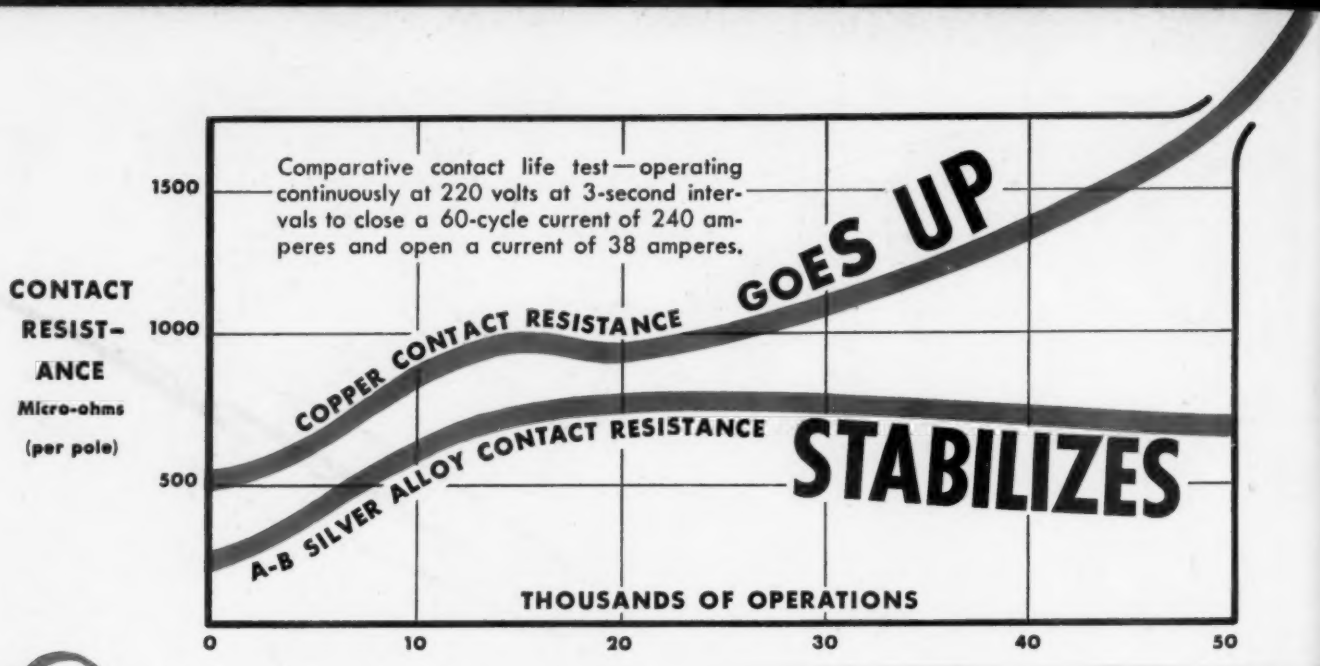
Bulletin 860 Solenoids

A-B Quality

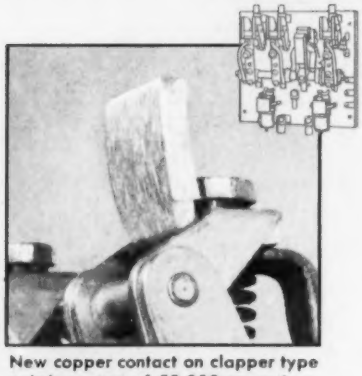
ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY



That's Why A-B SILVER ALLOY CONTACTS OUT-PERFORM COPPER CONTACTS



New copper contact on clapper type switch at start of 50,000 operations.

Same contact after test. Badly pitted and oxidized—must be replaced.

There's a big difference between copper and silver alloy contacts. It shows up quickly . . . in less than 50,000 operations . . . as revealed in the above test.

Copper contacts become coated with a high-resistance oxide that causes them to overheat. Heat . . . then more oxide . . . then more resistance . . . still more oxide . . . still more resistance . . . then failure and shutdown for replacement.

A-B silver alloy contacts also become coated with oxide . . . but silver oxide is just as good a conductor as the original metal. There is no heating . . . no increase in resistance . . . no matter how long A-B silver alloy contacts remain closed, they never fail. They never need filing, cleaning, or dressing. They are completely maintenance-free.

Every test . . . in laboratory or in service . . . verifies the superior performance of silver alloy contacts. Specify Allen-Bradley solenoid starters—all are equipped with patented A-B silver alloy contacts.

ALLEN-BRADLEY COMPANY
1316 S. Second St., Milwaukee, Wis.

A-B silver alloy contact on solenoid starter at start of 50,000 operations.

Same contact at the end of the test still in perfect operating condition.

A-B

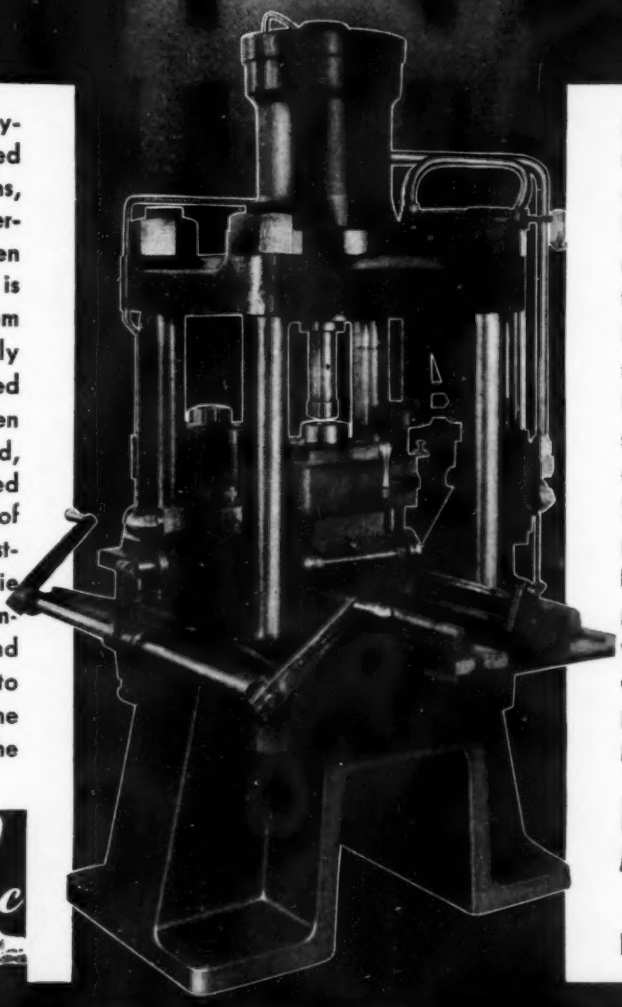
ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

ANNOUNCING MODEL "K" SERIES Hydraulic Presses

A new type of "Hy-Mac" hydraulic press that may be adapted to capacities up to 150 tons, (identified as a "K" Series) is operated by a separate motor driven power units. It is a press that is ordinarily manually controlled from a four-way valve—automatically cutting-off when the predetermined pressure or tonnage has been reached—ipm. of closing speed, power speed and opening speed as per specifications. The frame of the press is made up of heavy castings bolted together by steel tie rods with the power cylinder assembled vertically on the top and above a base platen 19" (right to left) x 13¼" (front to rear) on the 75- and 100-ton presses. The platen is 1" larger in each dimension on the lighter models and 1" or ½" smaller on the larger ones because of 3" instead of 4" tie rods on the former, and 4½" or 5" tie rods on the heavier types. Maximum daylight—the length of stroke, diameter of cylinder are built to specification, the bore and stroke varying in ratio to the capacity required. The platen is 27" from the floor—height 75-ton press—overall is 82" (varying a few inches one way or other depending upon length of stroke)—without power unit, the press occupies a floor space of 25" x 50"—power unit may be adjacent to press or a remote installation.



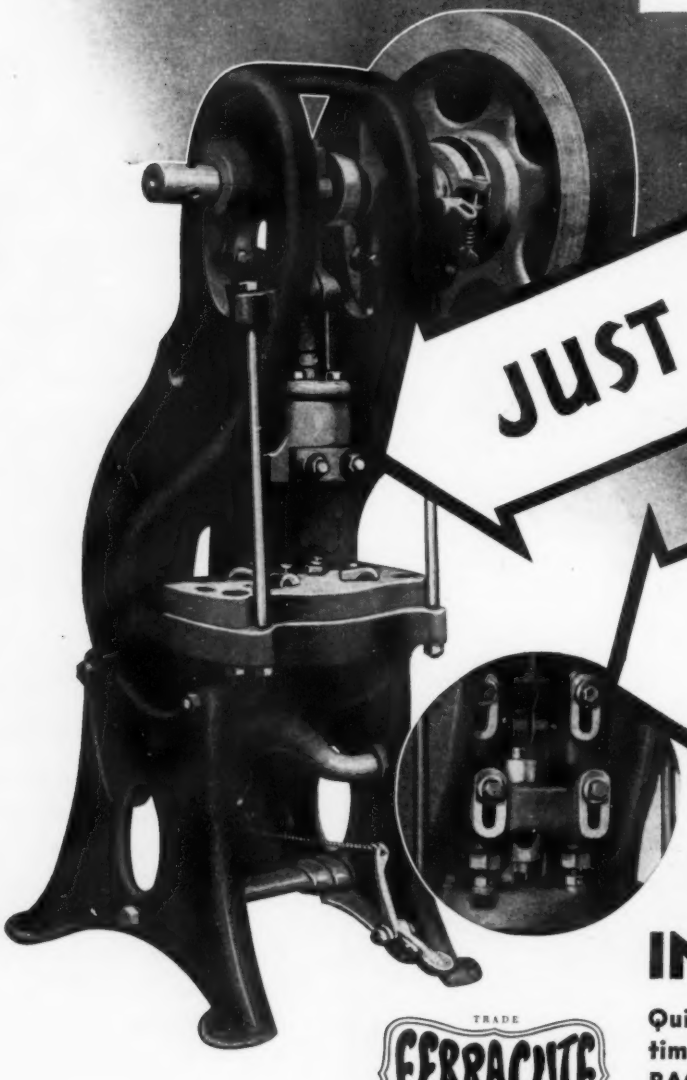
...del K75 (Illustrated)—...tons at 2000 lbs. per sq. ...the cylinder—10" bore ...9" stroke—here our fa...ties for making fixtures ...re used—the set-up pro...es for two operators—...ole arrangement.

Hy-Mac

HYDRAULIC MACHINERY, INC.
12825 FORD ROAD
DEARBORN, MICHIGAN

HYDRAULIC MACHINERY

Lesson in FERRACUTE FLEXIBILITY



JUST CHANGE THIS TO THIS

and SWING INTO PRODUCTION

Quick change-over to meet war-time or peace-time retooling demands is achieved in this FERRACUTE DRAWING PRESS. Just replace ram, pitman stem and strap with new double-action mechanism and you're ready to start production.

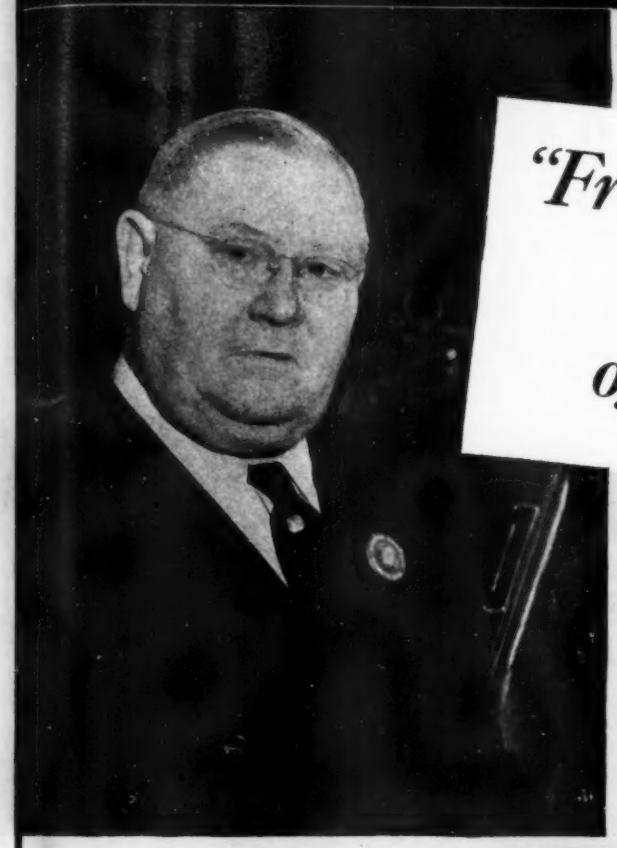
TRADE FERRACUTE MARK

The well-known Ferracute heavy frame coupled with the added tensile strength of the stay rods makes this press especially suitable for drawing or cutting heavy sheet metal. Stay rods may be safely removed but should be replaced when performing work approaching the limit of capacity. Open throat permits feeding stock from front and back in addition to side feeding. By inclining the press, gravity causes the finished work to fall freely to the rear of the press. Flexibility in this press is furthered by its adaptability to either V-belt or geared drive.

FERRACUTE MACHINE COMPANY

Presses and Press Brakes

BRIDGETON, NEW JERSEY, U. S. A.

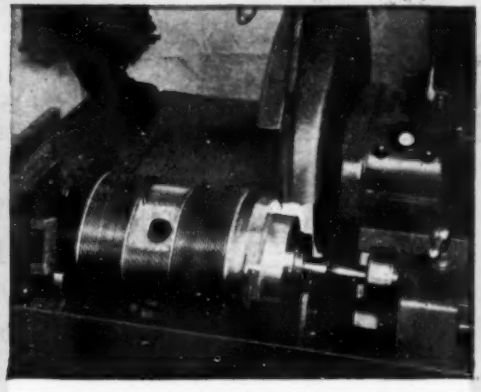


"Freedom from vibration an essential of precision grinding"

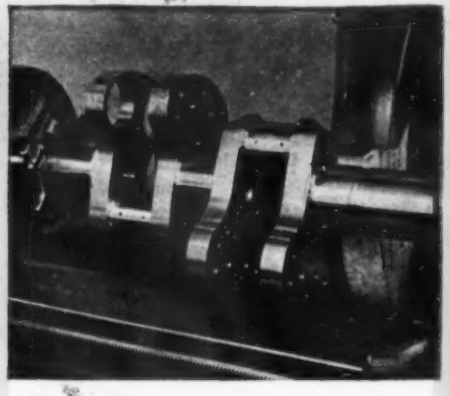
says HOWARD W. DUNBAR, V.P. and Gen. Mgr.
Norton Company, Grinding Machine Division
Worcester, Massachusetts

The Norton Company's biggest single contribution to the field of precision grinding in the War Effort is a 36" x 816" cylindrical grinder . . . sixty-eight feet between centers. The world's largest, it will work directly for Uncle Sam.

"To produce precision finishes to close tolerances, a grinding machine must be absolutely free from vibration. It is not enough merely to build a machine with massive construction and ample power, with grinding wheel and driving motor in perfect balance; it must have friction-free operation and proper lubrication.



"These principles were built into the first precision grinder by Norton in 1900. The lightweight, small wheel which did little but "tickle" or polish the work was discarded and ample weight, strength and power were established as fundamentals in production grinding. Present-day grinders differ only in refinement and still more massive construction.



"The operator, too, has a responsibility in obtaining precision and finish. He will get good stock removal only if he keeps his machine working under conditions approaching the ideal. Naturally for efficient stock removal he must have the most efficient grinding wheel for the job and must operate with the proper work-and-wheel speeds.

"Not the least important design factor is weight in mass, properly distributed to absorb vibration. Proper wheel truing is vital to precision grinding, and conversely, a machine free from vibration is essential to good wheel truing. Every effort must be made to maintain steady, constant and uniform pressure of the wheel against the work to avoid chatters and other variable grinding faults. In short, the operator must combat vibration in all its forms. Correct and constant lubrication will keep his machine operating smoothly."

In precision grinding the selection of the proper cutting oil is as important as freedom from vibration. That's why Shell has developed a control technique that "balances" the oil to the machine, the application and the tool. Call in the Shell man now for details.

SHELL

SHELL LATA OILS
FOR METAL WORKING

Heavy Duty Threading

—But Accurate

EXCLUSIVE ACME FEATURE

The Acme Micrometer adjustment of the die head is *quickly* regulated by the hand wheel without stopping rotation of the head.

THE micrometer adjustment of the die head, now standard equipment on all ACME XL Threading Machines, makes possible increased precision production of threaded parts from ½" to 3" in diameter. . . . Coupled with the ACME Tangent Die Head, this model XL threading machine is today's comparison of high speed productive quality in the heavy duty threading field. Will you be competing against ACME XL equipment after the war? Will your present threading machines stand the test of this competition? Bulletin XL-A tells the story—ask for it.

ACME MACHINERY DIVISION

of THE HILL ACME COMPANY

Established 1882

FORGING • THREADING • TAPPING • BOLT • NUT • RIVET MACHINES

4535 ST. CLAIR AVENUE

Cleveland, Ohio

DOW

DOWMETAL

Dow, pioneer in the manufacture of magnesium, is one of the world's largest producers. From sea water and Michigan brine pours this weight-saving metal—moving through Dow's mills and foundries—transformed into castings, forgings, sheet and extrusions—then converted to mighty weapons of war.

Today, all production is allocated to war needs. But Dow designers are studying magnesium's wider applications in such fields as transportation, machinery, portable tools, appliances for the home—in fact, wherever light metal is essential.

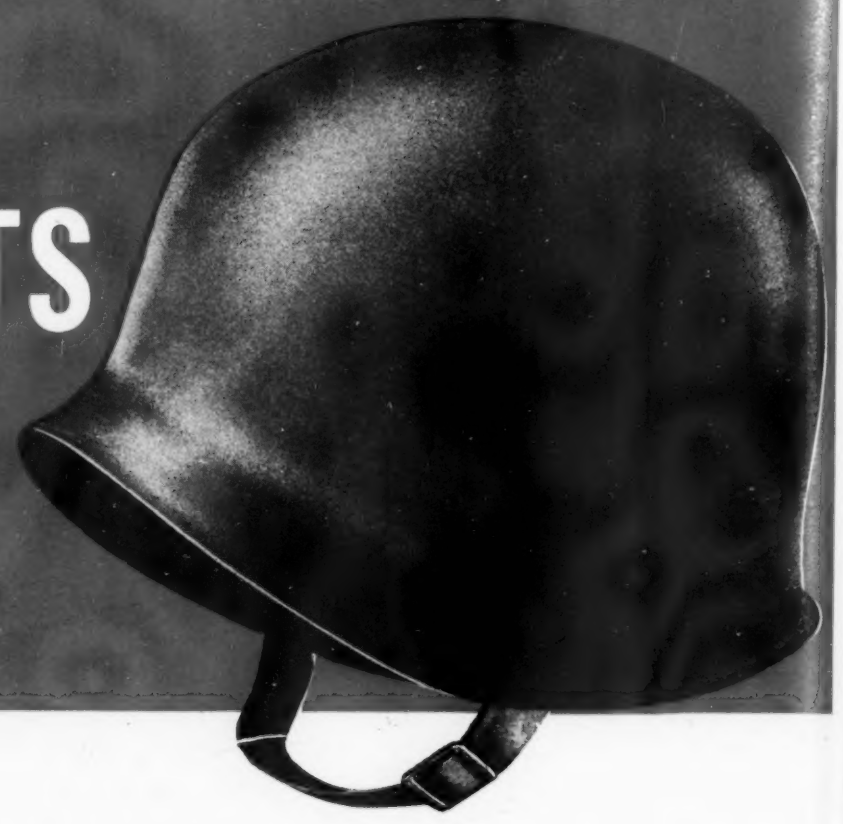
THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

MAGNESIUM

PRODUCER SINCE 1916

INGOT · CASTINGS · FORGINGS · SHEET · STRIP · PLATE · EXTRUSIONS

TAKE HELMETS for example:



THE SECRET of increased, smooth-flowing production in many plants making ordnance and other essential war supplies is that they KNOW WHAT degreasing and cleaning materials to use on EACH different metal or alloy in preparing it for final finishing operations.

Aluminum, zinc and similar sensitive metals can be safely cleaned only with materials that do not etch or pit surfaces. Cold rolled and other steels usually require heavy-duty, high-speed cleaning materials, particularly where smut is the primary deposit to be removed. Brass, bronze and copper, due to their susceptibility to tarnish or oxide formation, require still other materials for successful results. And equally important, the METHOD used for cleaning also vitally influences choice of particular material to use on a particular job.

Take Helmets as a Specific Instance . . .

A TANK method for degreasing usually requires one type of material, while an automatic washing machine method necessitates another. But you MUST KNOW WHICH! This example, typical among many on a wide range of war work, illustrates the importance of taking full advantage of Oakite experience ALREADY AVAILABLE . . . of securing the competent, personal help of trained men well-grounded in ALL the basic fundamentals of degreasing both ferrous and non-ferrous metals. Inquiries on your problems invited and promptly answered.

OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK, N. Y.
Technical Service Representatives in All Principal Cities of the United States and Canada

ASK US ABOUT TIME-SAVING OAKITE MATERIALS FOR:

Degreasing steel shells before painting

★

Safely preparing aluminum for anodizing and magnesium for Dow surface treatments

★

Machining fuse bodies and gun parts

★

Cleaning & de-scaling castings before plating, black oxide finishing, etc.

★

Drawing & cleaning brass cartridge parts

★

Rust-proofing torpedo parts between manufacturing operations

★

Cleaning detonator caps before filling

OAKITE CLEANING

MATERIALS . . . METHODS . . . SERVICE

FOR EVERY CLEANING REQUIREMENT

ARMY E NAVY

WOMEN WORKERS CAN HANDLE MASONITE* DIE STOCK

Women workers at Glenn L. Martin Company are shown using dies of Masonite Die Stock in the production of airplane parts by means of rubber hydro-press.

MORE and more women are helping to speed production in America's roaring airplane factories today—and many of them are working with Masonite Die Stock.

Because this amazing semi-plastic material is only one-sixth the weight of steel, forming blocks, jigs, templates and assembly fixtures are easily handled by women.

With all its light weight, Masonite Die Stock has great compressive and flexural strength . . . stands up under heavy-duty production runs . . . can be machined and fabricated in metal-working or pattern shops with great speed . . . saves manufacturers precious time, as well as expense in tooling up and getting into production . . . conserves steel for other vital purposes.

If you want a practical material for production dies, investigate Masonite Die Stock. This material is available in thicknesses of ¼ to 4 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For further details, fill out and mail coupon below.

It's Right MASONITE DIE STOCK

*TRADE-MARK REG. U. S. PAT. OFF. "MASONITE" IDENTIFIES ALL PRODUCTS MARKETED BY MASONITE CORPORATION. COPYRIGHT 1943, MASONITE CORP.

MASONITE CORPORATION, *Dept. AM-5, 111 West Washington Street, Chicago, Ill.*

Please send me illustrative literature and complete information about Masonite Die Stock.

Name and Firm _____

Address _____

City _____ *State* _____

SAFCO METAL WORKING LUBRICANTS
for peak production

Production up 20% . . . up 30% and more!* Many reports like these are coming in from important war production plants who have tested Swan-Finch 'SAFCO' coolants and lubricants in metal working operations.

As requirements become *more* exacting . . . closer tolerances, smoother finishes, greater operating speeds, 'SAFCO' lubricants become *more* in demand than ever.

The rapidly increasing use of 'SAFCO' lubricants when the job gets tough, is due to our background of cumulative experience . . . over 40 years of continuous research in formulating and developing metal working lubricants.

Every day our field men are *proving* thru tests and recommendations that 'SAFCO' Core Oils can save time . . . *can increase production.*

It will pay you real dividends to get better acquainted with the Swan-Finch field representative who covers your district. Capable and able, they are constantly devising *new* ways and means for stepping up production.

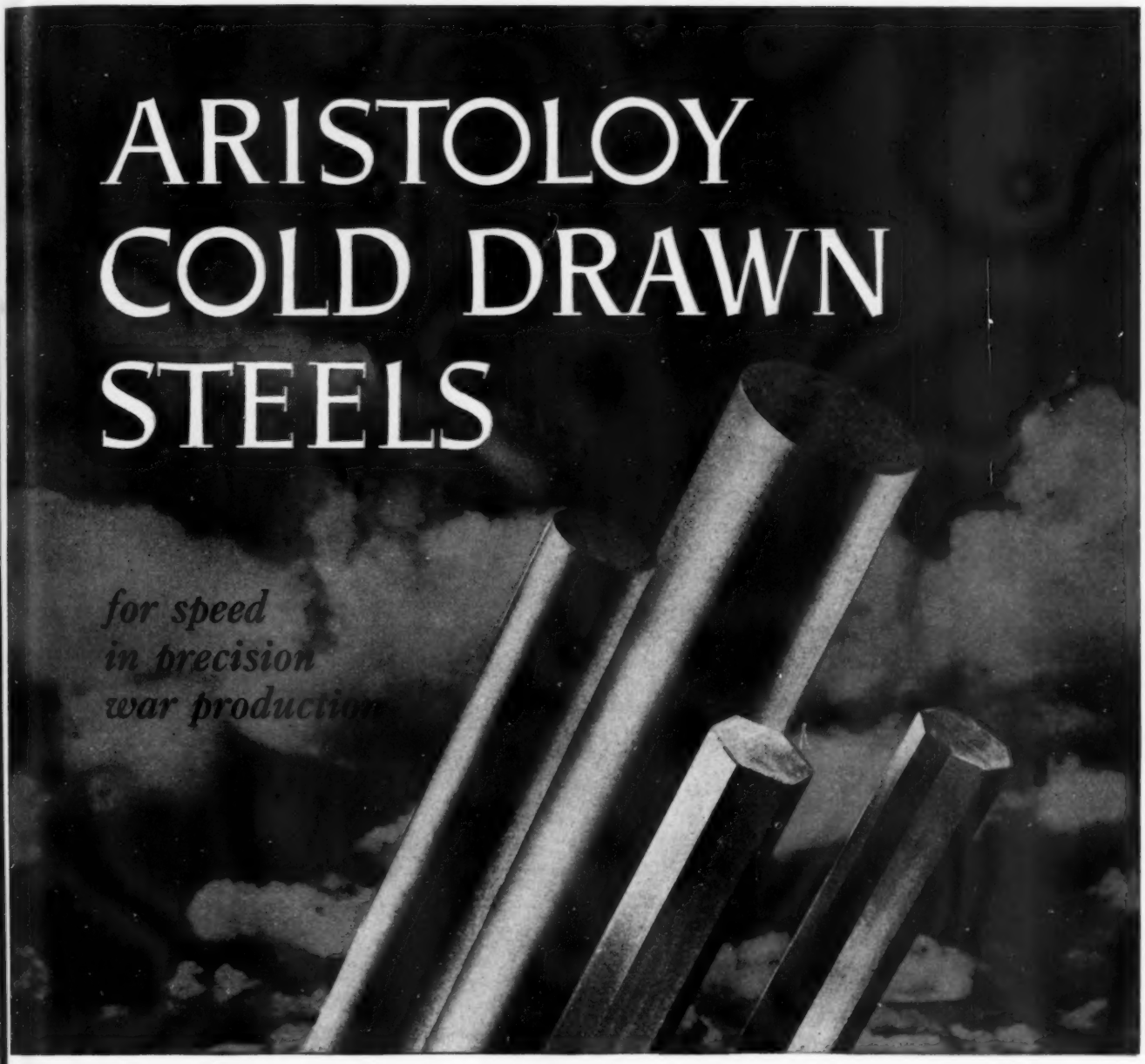
For instance meet E. O. Ericsson. He is one of our highly trained and experienced staff of fieldmen.

ASK US TO HAVE HIM CALL—NO OBLIGATION.

**Reports in our files on core oil operations sent upon request.*

SWAN-FINCH OIL CORPORATION

Offices		Plants	
New York City—Executive Offices	R.C.A. Building, West	Newark, N. J.	120 Lister Avenue
Chicago, Ill.	201 North Wells Street	Chicago, Ill.	5849 West 66th Street (Clearing, Ill.)
Detroit, Mich.	2596 Hart Avenue	Detroit, Mich.	2596 Hart Avenue



Cold Drawn Steels have the vital wartime job of keeping fast automatic production machines operating continuously at peak loads. The uniform surface and close tolerance of Aristoloy Cold Drawn Steels assure smooth machining with longer tool life and uninterrupted production.

COPPERWELD STEEL COMPANY
WARREN, OHIO

ARISTOLOY STEELS

TO BUILD MORE • • • BETTER • • • FASTER

Carbon Tool Steels • Aircraft Quality Steels • Nitralloy Steels • Alloy Tool Steels • Stainless Steels • Bearing Quality Steels • Cold Drawn Steels

LONGER ELECTRODES

...MEAN *FEWER* STUBS

Use the Longest and Largest Electrode Available

STUBS can be held to a minimum by using longer and larger diameter electrodes. In that way you not only leave fewer discarded stubs for a given length of weld, but you also save time by reducing the number of electrode changes necessary. In addition, you can increase welding speeds 25–50%, because larger diameter electrodes provide much faster metal deposition.

This is only one of many ways by which you can stretch your own supply of welding electrodes. See that all your welders join in the war against waste by observing this precaution as well as those shown at the right.

WELDING ELECTRODES ARE SCARCE
DON'T WASTE THEM

Use electrodes down to a 2"stub.

Don't bend electrodes unless absolutely necessary.

Make sure that joints are fitted properly before welding.

Make legs of fillet welds equal; face of fillet welds flat.

Be sure to save all your stubs.

Air Reduction

***General Offices:* 60 EAST 42nd ST., NEW YORK, N. Y.**

IN TEXAS: MAGNOLIA-AIRCO GAS PRODUCTS CO.
***General Offices:* HOUSTON, TEXAS**

AIRCO

WILSON

IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

Why there is only One Man in this picture

Or How to Make Your Employment Department Happy

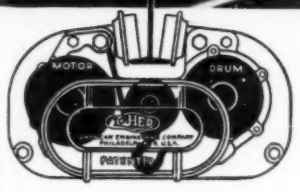
On page 3 in the current Lo-Hed Catalog and, in many earlier issues, you will find this brief statement: "Can be operated with one hand by one man". *That is a fact.* A Lo-Hed Hoist can be operated by one man with one hand, leaving the other hand free to guide the load. And that is the kind of hoist you need any place in your plant—wherever labor is scarce, wherever the time of men and women must be saved. Don't waste productive time and payroll on tiring, back-breaking, brute jobs. Let a Lo-Hed do the heavy lifting.

Write or telegraph for full information on a Lo-Hed Hoist.

LO-HED IS THE "BALANCED" HOIST FOR HEAVY DUTY SERVICE

The *balanced* arrangement of motor and drum in a Lo-Hed Hoist allows the hook to be pulled up until it almost touches the beam—a desirable plus feature for which you pay no premium. This same arrangement makes possible the use of an all spur gear drive from motor to drum.

Other important features of the Lo-Hed Hoist are the heavy duty hoist motor; strong, short shafts; high duty bearings; 100% positive automatic stop; and removable protective covers for all vital parts.



The Lo-Hed Hoist can be adapted for operation on any monorail system. There's a Balanced Lo-Hed Electric Hoist for Every Purpose.

Other A-E-CO Products:
TAYLOR STOKERS
MARINE DECK AUXILIARIES
HELE-SHAW FLUID POWER

AE CO 75th ANNIVERSARY

AMERICAN ENGINEERING COMPANY

2407 ARAMINGO AVENUE
PHILADELPHIA, PENNA.

You Name the Part —

Probably we make it

Brake Shoe **MAKES PARTS FOR MANUFACTURERS . . .** Parts in many kinds of metals and metal alloys, compositions and fabric . . . parts that are cast, upset, drop forged and molded. In war as in peace, Brake Shoe ships millions of parts to thousands of manufacturers, in many fields of industry.

The services of our research and development engineers are available for immediate or post-war problems.

AMERICAN BRAKE SHOE COMPANY, 230 PARK AVENUE, NEW YORK

PARTS FOR— MACHINERY

Meehanite castings, upset and drop forgings, bearings. Manganese steel gears, sheaves. Pressure castings.

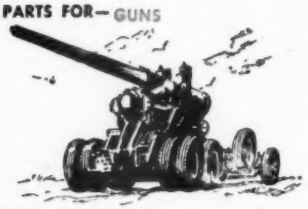
PARTS FOR— EXCAVATING

Placer dredge buckets, dredger and power shovel dippers. Quarrying, mining equipment parts. Bronze bearings.

PARTS FOR— SHIPS

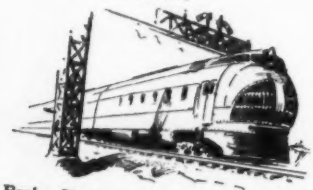
Brass and non-metallic bearings. ABK bearing wheels. Air compressors. Parts for all types of ships.

PARTS FOR— GUNS



Upset forgings, non-ferrous parts for naval and field guns. Liners, gear blanks, parts for gun assemblies.

PARTS FOR— TRAINS



Brake Shoes and Meehanite castings. Manganese steel center and wear plates. Journal bearings.

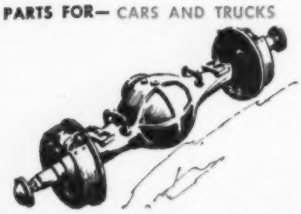
PARTS FOR— TANKS

Forged shafts, transmission parts, brake levers, drain valve cages, armor plate castings. Bronze bearings.

PARTS FOR— PLANES

Propeller hubs, machined parts for engines, retractable landing gears. Non-ferrous castings and forgings.

PARTS FOR— CARS AND TRUCKS



Automotive, industrial brake lining, axle, gear blank forgings, fan belts, clutch facings. Garage equipment.

AMERICAN Brake Shoe COMPANY

58 PLANTS SERVING INDUSTRY AND TRANSPORTATION

American Brakeblok Division	Detroit, Mich.
Ramapo Ajax Division	New York City
American Manganese Steel Division	Chicago Heights, Ill.
Brake Shoe and Castings Division	New York City
Kellogg Division	Rochester, N. Y.
American Forge Division	Chicago, Ill.
Southern Wheel Division	New York City
National Bearing Metals Corp.	St. Louis, Mo.

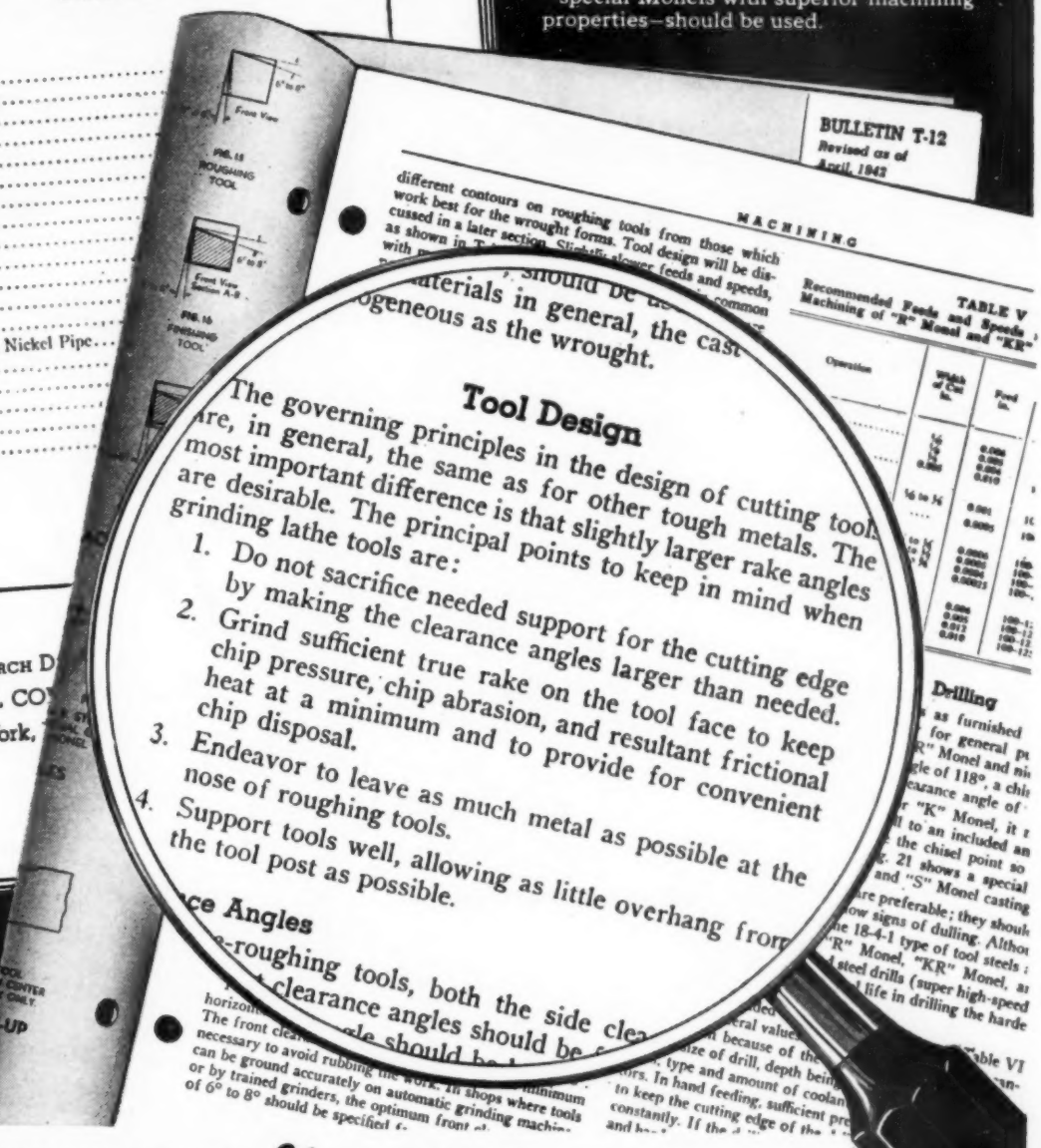
Machining

Monel
"R" Monel
Inconel
"K" Monel
"KR" Monel
Nickel

Techniques for machining the different Monels are described in Bulletin T-12.

As suggested by the Table of Contents at the left, this booklet answers many questions on tool grinding, rakes, clearances, speeds, etc. which you must know to establish your particular technique for machining Monel. Also, this bulletin will help you decide which Monel to use under given conditions, and when "R" and "KR" —special Monels with superior machining properties—should be used.

Stock for Machining
Mechanical Properties
Tool Design
Tool Steel
Cutting Compounds
Cutting-Off Operations
Turning and Boring
Layouts of Tool Design
Drilling
Reaming
Tapping
Lathe Threading
Thread Chasing
Hand Threading Monel and Nickel Pipe
Planing
Milling
Precision Grinding
Grinding Experiments
Available Bulletins


BULLETIN T-12
Revised as of April, 1943
MACHINING
TABLE V
Drilling
Tool Design
The governing principles in the design of cutting tools are, in general, the same as for other tough metals. The most important difference is that slightly larger rake angles are desirable. The principal points to keep in mind when grinding lathe tools are:
1. Do not sacrifice needed support for the cutting edge by making the clearance angles larger than needed.
2. Grind sufficient true rake on the tool face to keep chip pressure, chip abrasion, and resultant frictional heat at a minimum and to provide for convenient chip disposal.
3. Endeavor to leave as much metal as possible at the nose of roughing tools.
4. Support tools well, allowing as little overhang from the tool post as possible.
Clearance Angles

DEVELOPMENT AND RESEARCH D
INTERNATIONAL NICKEL CO
67 Wall Street, New York,

SAVE MACHINING TIME AND MONEY—*Use* "R" MONEL or "KR" MONEL

FREE BULLETINS

Every plant holding contracts which require the machining of Monel should have Bulletin T-12. Don't hesitate to write for as many copies as you can use. Ask also for the helpful reprint "The Working of High Nickel Alloys."

The International Nickel Company, Inc.
67 Wall Street, New York, N. Y.

Gentlemen: Please send me copy of your Machining Bulletin T-12 and also the reprint "The Working of High Nickel Alloys."

Name.....

Title.....

Company.....

A. M. 5-13-43

Address.....

SECOMET

DIAMOND WHEELS

can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-blade tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation.

J. K. SMIT & SONS

157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

Acme for Action

The fast action of the speedy Jeep is serving many vital needs of our boys in the battle areas—helping bring nearer the Day of Victory.

And to help speed that Day of Victory, we at Acme welcome opportunities to try to break our own records in turning out the patterns, dies, gages, castings, and specialized tools needed by metal working war industries.

Our engineers, through their long experience, are frequently able to submit recommendations for specially designed tools to speed production line operations.

Submit your requirements, without obligation.

ACME PATTERN & TOOL COMPANY, Inc.
DAYTON, OHIO

Heat-Treated Aluminum Aircraft Castings—Patterns—Tools—Tool Designing—Production Processing

For VICTORY buy WAR BONDS and STAMPS

ARMY E NAVY

FLUORESCENT LIGHTING
for War Plants

ANOTHER MARTIN-GIBSON DETROIT PRODUCT

Available in two 40-watt, three 40-watt and two 100-watt sizes. Features high reflection factor (89 to 91%) reduced weight; streamlined, continuous wireway.

Sold exclusively through wholesalers
On-the-Spot Information and Service

Martin-Gibson Fluorescent Luminaires are a vital part of the nation's war production program. They are helping to speed production in some of the nation's outstanding war production plants . . . and the *line* includes everything needed to do a good lighting job . . . in any plant, anywhere.

Produced in the world's mass production center, Martin-Gibson Fluorescent fixtures exemplify in quality, efficiency and economy all the tangible advantages of mass production skill.

Typical M-G Luminaire shown above also available in continuous runs. Our catalog shows this and in addition, the complete M-G line that will be available *after the duration.* Send for it.

Shortly we will have ready for you *new Luminaires* using a minimum of critical materials. These will be available to all war plants requiring improved production lighting. Write now and let us put you on our mailing list to receive early information about these new products.

We sell through wholesalers exclusively!

When we answer your request for catalog or other information, we will include address of our nearest wholesale representative.

To Wholesalers: *If Martin-Gibson Luminaires are not already wholesaled in your ommunity, write us. You will like our broad, fair policies.*

Will soon be ready for you

New line of Brilliantly Designed Luminaires for War Plants

Employ a minimum of critical materials. Sleek and neat in appearance—efficient in operation. Feature practical advantages that will please buyers—and sellers. Be sure and write for advance information.

New catalog sent on request

MARTIN-GIBSON CO.
999 HARPER AVENUE • DETROIT, MICHIGAN

Paint Adhesion
WITHOUT ANODIZING

TURCO

Phosphatizing With
W. O. #1

Try this quick, low-cost method of obtaining adhesion for paints on metals. Turco Phosphatizing with W. O. #1 produces a passive, slightly porous surface which is non-reactive to moisture and makes a thoroughly satisfactory base under all land conditions. It is harmless to metals, rubber or glass.

This is the ideal method for treating sheets and large assemblies. It may be applied by immersion, swabbing or spraying and acts as a cleaning agent when used.

No special equipment required for this cheap and speedy process.

Mail the coupon below for complete information.

MAIL THIS COUPON 1-53

TURCO PRODUCTS, INC.
6135 South Central Avenue
Los Angeles, Calif.

Please send free literature on Turco W. O. #1
Name _____ Title _____
Firm _____ State _____
Address _____

TURCO PRODUCTS, INC.

MAIN OFFICES & FACTORY • 6135 S. CENTRAL AVE.
LOS ANGELES, CALIF.
MIDWEST FACTORY • 4856 SOUTH HALSTEAD ST.
CHICAGO, ILLINOIS

SERVICE REPRESENTATIVES AND WAREHOUSE STOCKS IN ALL PRINCIPAL CITIES

ALLOY
S.A.E. HY-TEN N.E.
STEELS

We solicit your inquiries

Even though warehouse stocks today are not as plentiful as you and we would like there are still a substantial number of sizes in a variety of analyses available for immediate shipment. We will do everything within our power to help you make the guns and tools and ships and planes and tanks which will win the war.

Wheelock, Lovejoy & Co., Inc.
Main Offices: 137 Sidney St., Cambridge, Mass.
Cleveland, Chicago, Newark, Detroit, Buffalo, Cincinnati

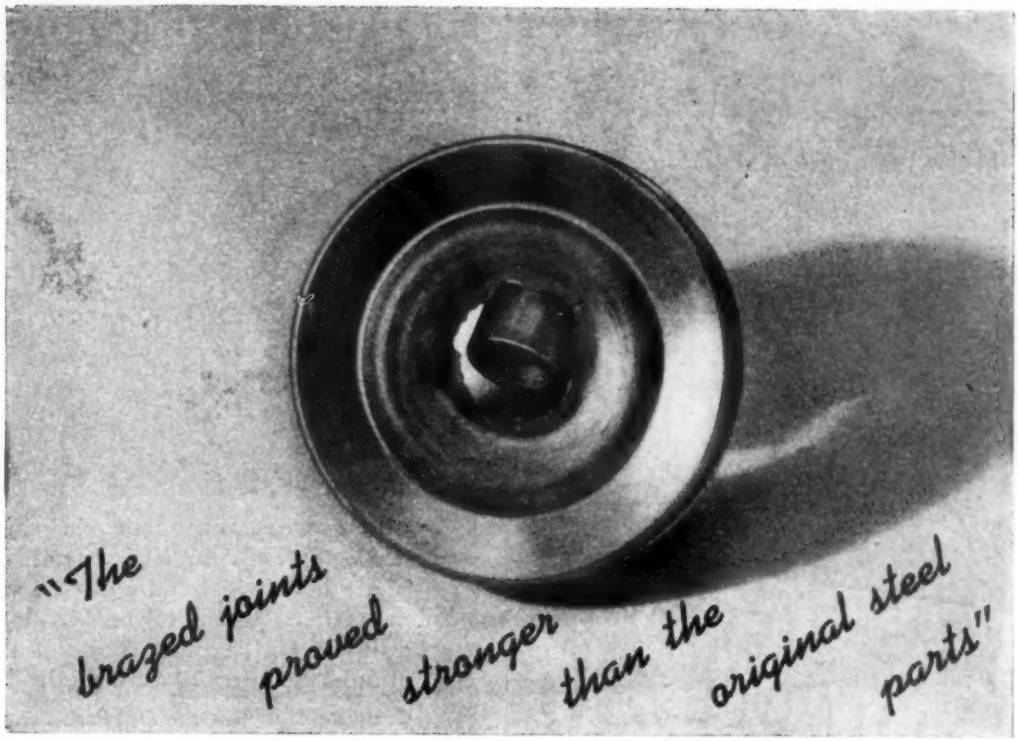
VULCAN VERTICAL Heat Treating FURNACE

For Suspending Work That Is Susceptible to Warpage

VULCAN furnaces of the type illustrated have a temperature range from 450°F. to 2350°F., and are designed for suspending long work in a vertical position or small work in baskets. Furnaces of this type may be direct oil or gas fired; indirect or convection heated; or electrically heated; and can be furnished in any desired size. Atmospheres for clean hardening or bright annealing can be readily applied.

Although custom-built, VULCAN Furnaces cost no more than those of standard design. Contact our Engineering Department regarding your requirements.

VULCAN CORPORATION
1737 CHERRY STREET, PHILADELPHIA, PA.



Design *Your* Metal Parts For Copper Brazing

Miscellaneous steel assemblies are joined 60% to 75% faster at 1/4 the former labor cost by the copper brazing process.

"Greatly improved results — neater, stronger joints — 60 to 75% faster, at about one quarter the former labor cost," that briefly is the report received from the production manager of a prominent midwestern plant after installing an E F continuous copper brazing furnace for joining some of their steel assemblies.

Within a month after installing their first brazing furnace, a second similar but larger furnace was ordered for joining other products — both furnaces are now operating side by side, joining all kinds of assemblies — large and small — neatly, economically and securely.

Products difficult or expensive to make in one piece can be made in several pieces and joined —thus not only reducing the cost but actually improving the quality and appearance. Products requiring several stampings joined or requiring screw machine parts, forgings and stampings to complete the unit, can be neatly and economically joined right in the production line in your shop.

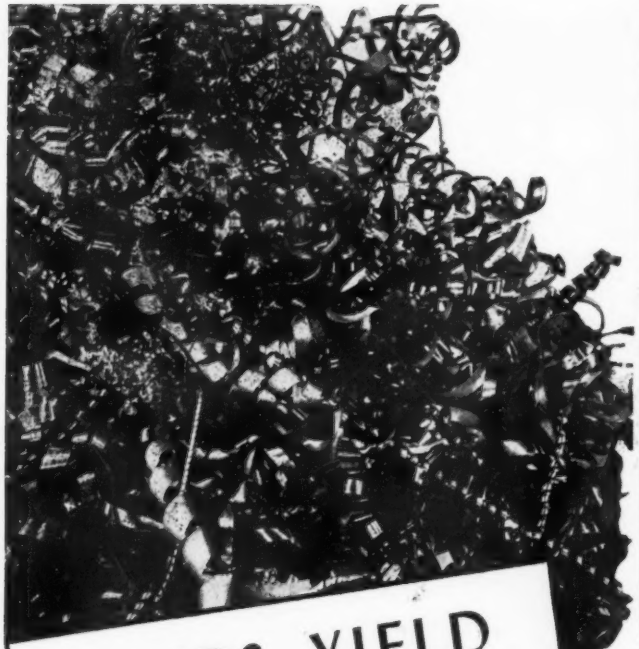
Any number of joints in the same product or any number of pieces can be joined at one time. The most intricate parts or assemblies are made to actually "grow together," and joints made which are as strong or even stronger than the original parts. On some parts it is possible to anneal and braze in one operation. Investigate the brazing process for your products. With slight changes in design you may be able to join your metal assemblies, neater, cheaper and stronger by this method.

Send for printed matter showing various types of E F Copper Brazing Furnaces.

Investigate the Copper Brazing Process For Joining YOUR Metal Parts

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production



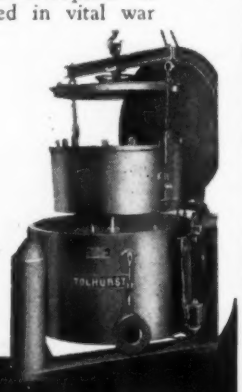
CHIPS YIELD VALUABLE CUTTING OIL

Reclaims up to 98.6%

With automatic screw machines working three shifts, the number of chips is greatly increased. Hidden in these chips are large amounts of valuable cutting oil. Tolhurst Chip Wringers recover as much as 98.6% of this oil through the application of centrifugal force only. Unskilled help can operate Tolhurst Chip Wringers efficiently.

REDUCE TOOL WEAR—Tool room records show reductions in tool wear of as much as 50% after installing Tolhurst equipment. The plentiful supply of reclaimed oil results in a more generous and conscientious use of cutting oil. Tools require less attention. Production goes on uninterrupted. If your machine tools are being used in vital war production, investigate Tolhurst Chip Wringers for conserving cutting oil—reducing tool wear. Details will gladly be sent on request.

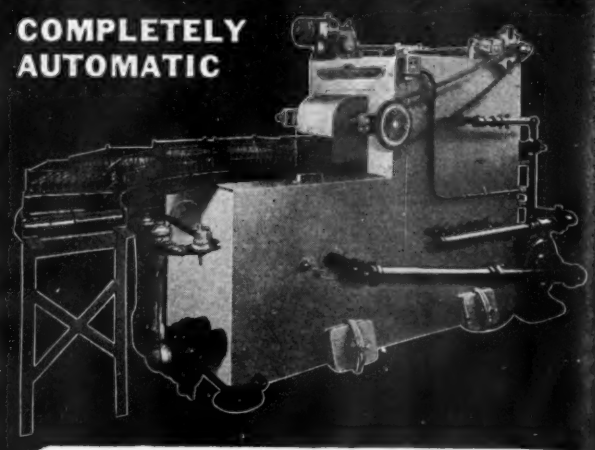
DIVISION OF AMERICAN MACHINE AND METALS, INC.
EAST MOLINE, ILLINOIS



TOLHURST CHIP WRINGERS

METAL CLEANING EQUIPMENT

COMPLETELY AUTOMATIC



Conveyorize your metal cleaning operations! Barry-Wehmiller Metal Cleaning Equipment will handle a wide variety of metal parts without labor for loading or unloading. Illustrated is one of a number of units cleaning 20 mm. shell.

Completely Automatic • One Push-Button Control
Spray or Submerged Types
Solvent or Alkali Type Cleaning

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Filtaire PORTABLE DUST COLLECTORS

The Filtaire Portable Dust Collector is a completely self-contained unit that will soon pay for itself in dozens of spots in your shop. It stops the damage caused by dust and dirt from grinding and polishing operations. The Filtaire is equipped with a replaceable Dustop filter which is inexpensive and absolutely fireproof. Plug the Filtaire into any 110-volt line and it's ready to go. Write for descriptive folder.

EDWARD BLAKE COMPANY
634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.
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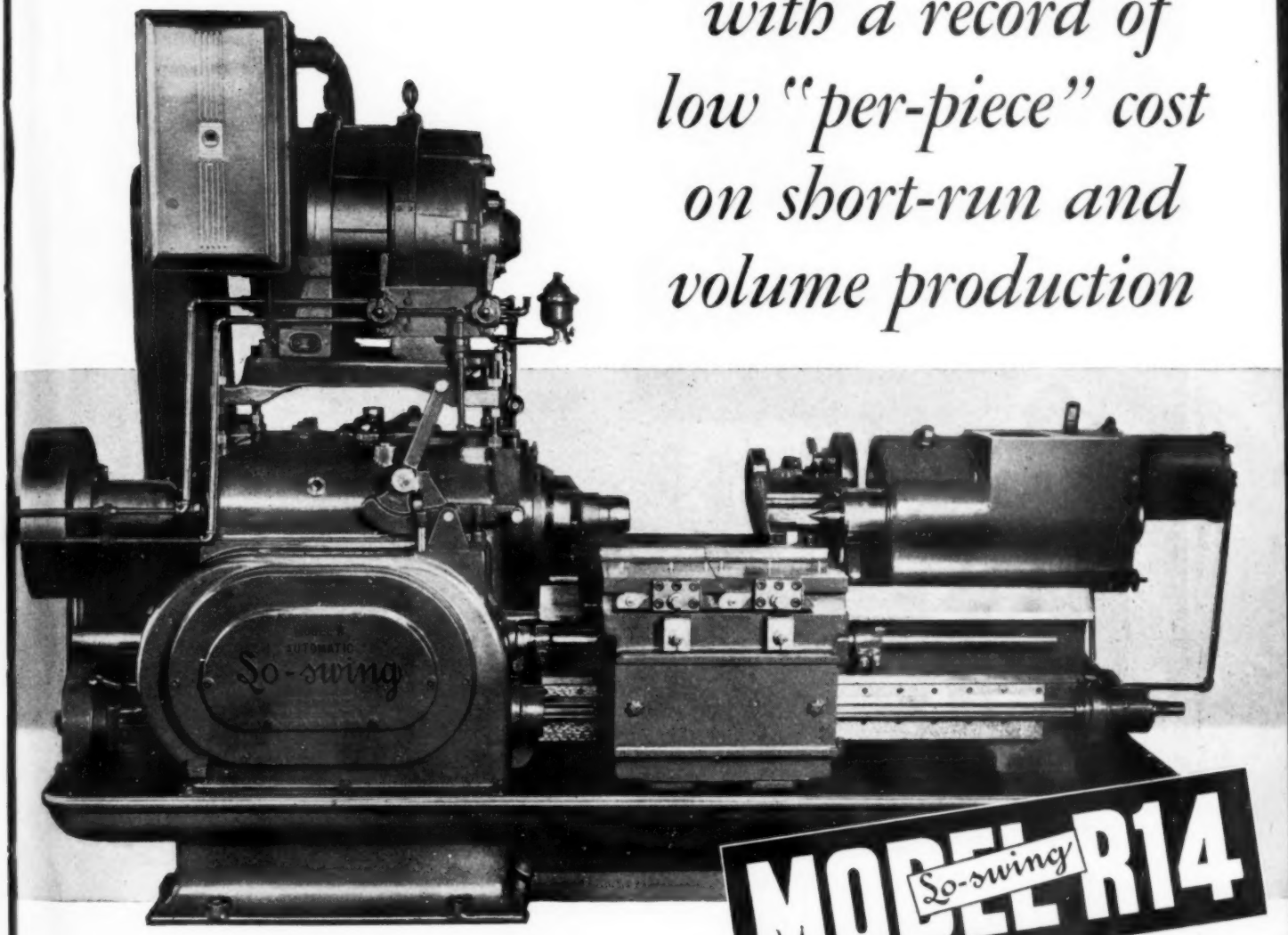
with a record of low "per-piece" cost on short-run and volume production

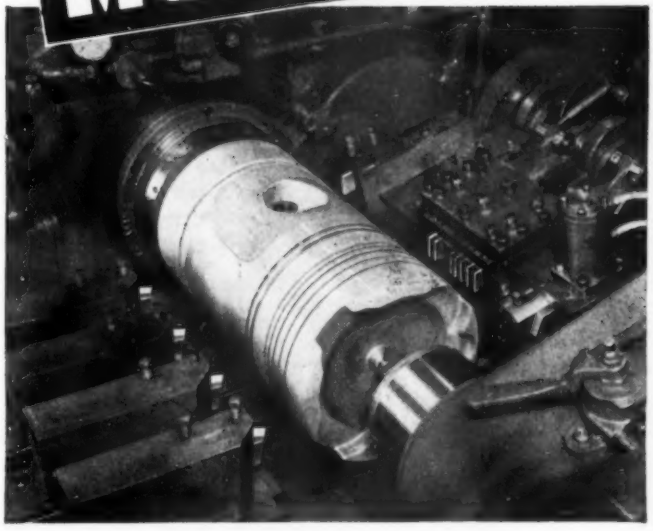


A BIG, powerful Automatic suitable for armament, aircraft, truck and tractor work because it provides the power, rigidity and tool support necessary for heavy multiple tool turning. Model R-14 incorporates the Seneca Falls Simplified Change-Over Mechanism, making change-over from job to job merely a matter of a few minutes' adjustment. Length of carriage stroke and rapid traverse adjustment may be varied without changing any cam.

Positive operation, wide flexibility and servicing simplicity are important advantages of this design. Model R-14 may be equipped with a third arm (overhead) as well as additional back squaring attachments, carriages, carriage slides and work handling devices.

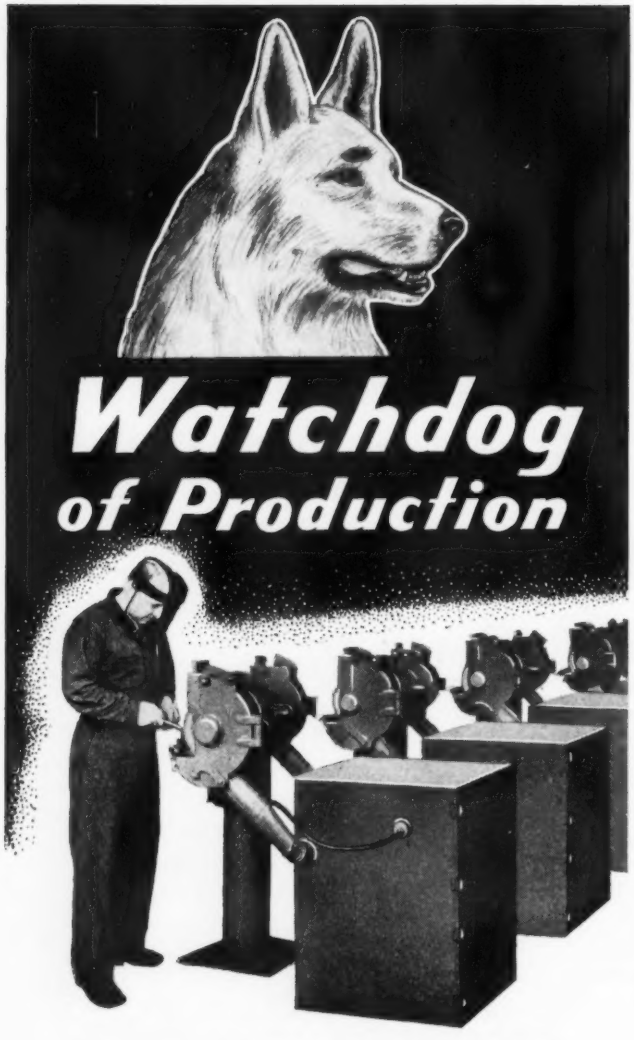
This lathe is being used for turning aircraft motor cylinders, heavy tank parts, aircraft landing struts, heavy projectiles and other war work.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.



Close-up view of a Model R-14 tooled to automatically turn, groove and face special alloy pistons of 10.5" diameter.

LATHE NEWS from SENECA FALLS

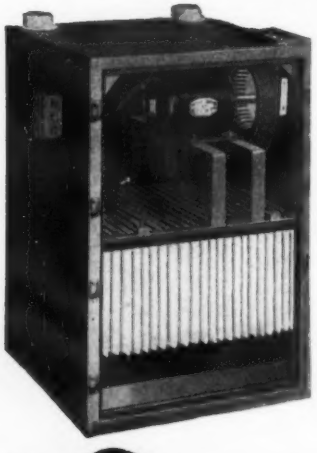


TORIT DUST COLLECTORS

Protection for Men and Machines

Production will win this war and must not be retarded by "machine breakdowns" or lost man-hours caused by dust.

A Torit Self-contained Dust Collector, standing "watch" on your protection line, is your assurance against this menace.



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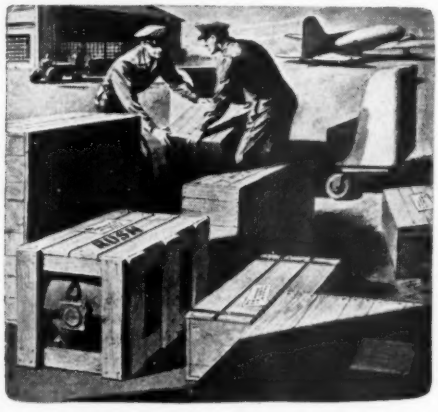
This motor was delayed



P.M. PICK-UP

Shipments ready for morning pickup but held for "late afternoon" routine, may be subject to delay. Heavy, peak-hour traffic may keep them grounded until a midnight or early morning plane.

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To move emergency parts and critical material at 3-mile-a-minute speed, Air Express is on the job around the clock—not only on the home front, but working hand in hand with Army and Navy Air Transport services to supply our fighting fronts throughout the world.

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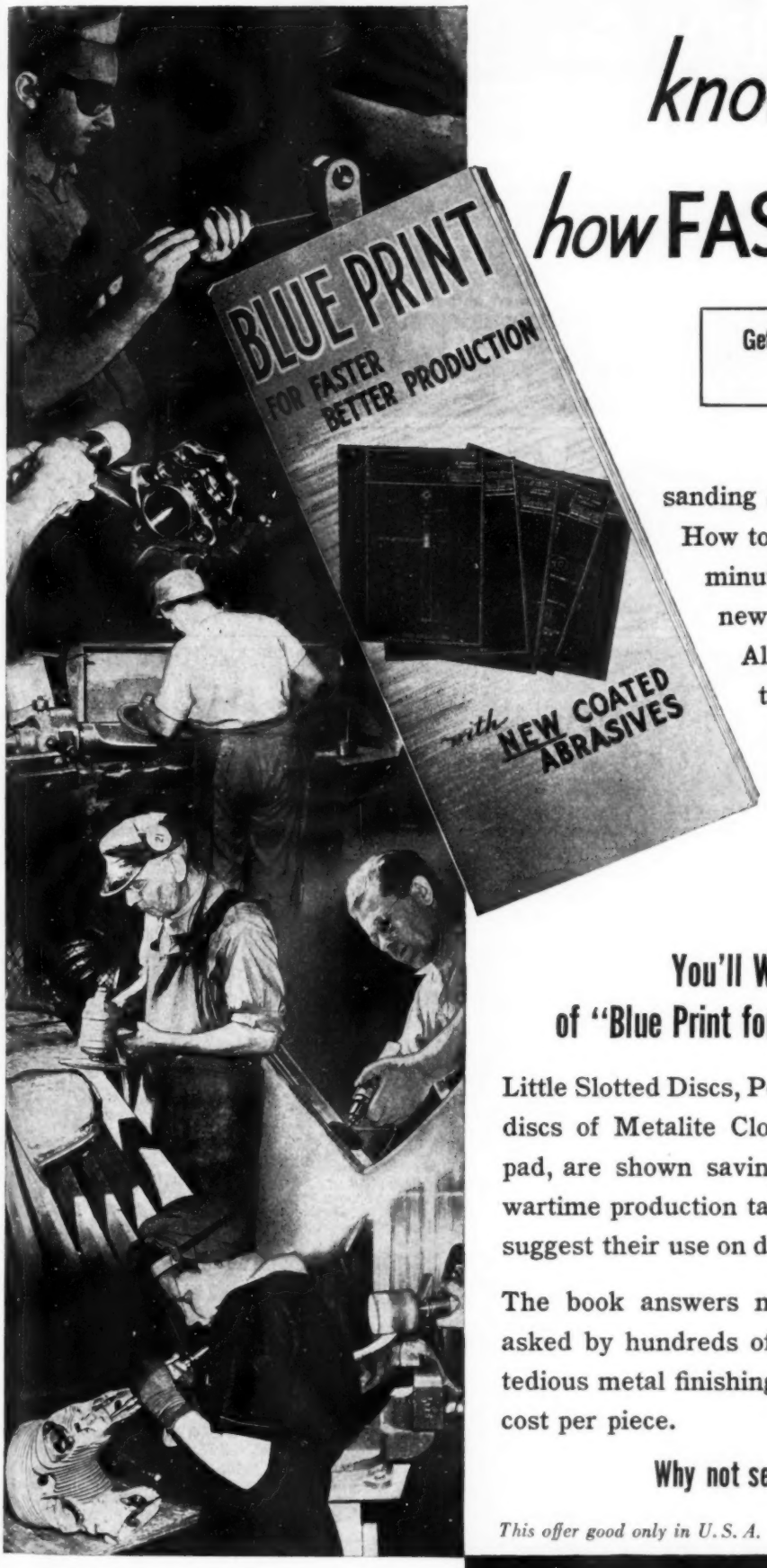

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For, liquid heat treating baths, soft metal melting, etc.

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. . . with NEW FEATURES not found in Grinders costing *many times as much*

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Superior Features of this TOOLMAKER SURFACE GRINDER

There are so many unusual features on this new Surface Grinder that it has to be seen and operated to be fully appreciated—but here are a few of the "highlights":

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Maximum length that can be ground—13½"; Maximum width that can be ground—6"; Maximum space under 7" wheel to table—9½"; Maximum space under 7" wheel to B & S No. 510 Magnetic chuck—6"; Table surface 5¾" x 12"; Traverse feed; one graduation is .001"; Maximum adjustment of wheel by means of micrometer is ⅛"; each graduation is .0005"; Minimum diameter cup wheel with standard guard in place 3½"; Maximum diameter wheel 7".

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THE ARMY-NAVY "E"—awarded for excellence in the production of machine tools vitally needed in the war effort.

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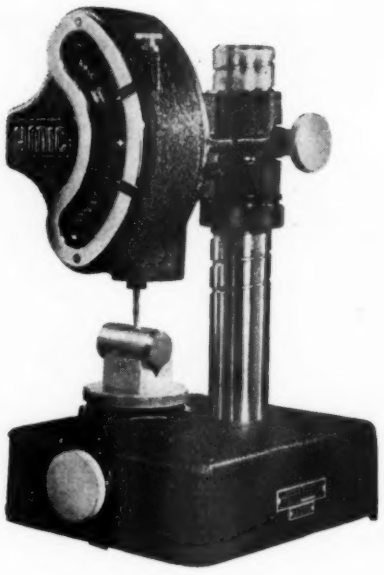

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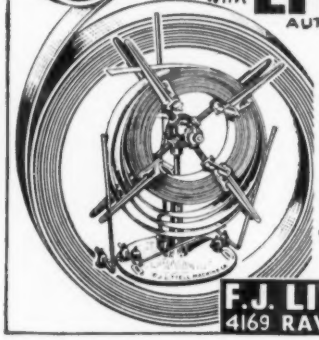

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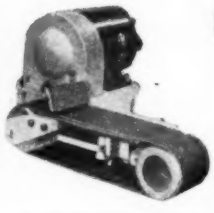

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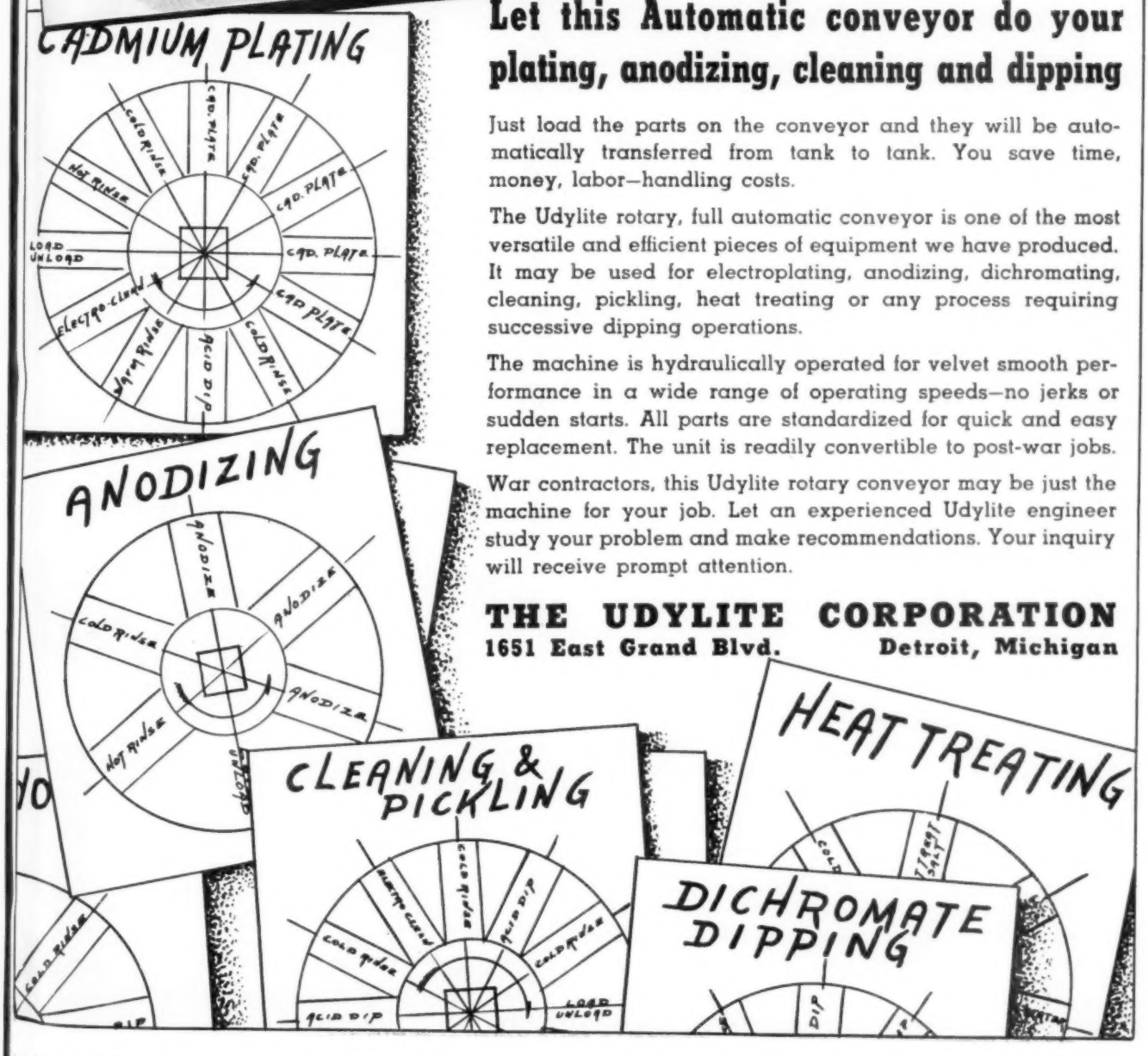

Let this Automatic conveyor do your plating, anodizing, cleaning and dipping

Just load the parts on the conveyor and they will be automatically transferred from tank to tank. You save time, money, labor—handling costs.

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NEW Revolutionary TOOL GRINDING PRINCIPLE . . .

The BURA-WAY Makes Possible . . .

- Generation of relief angles with uniform support to the cutting edge, as measured in the direction of tool feed
- Every cutting tool a precision instrument
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What This Adds Up To . . .

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- The opportunity, for the first time, to change tools at predetermined intervals
- Tremendous savings both now and later when we return to peace-time production

Write on company letterhead for informative literature on the Bura-way.

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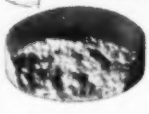
In all leading industrial plants — wherever men sweat and do hot work — salt tablets are a "must".

This Is What Happens When Sweating Robs the Body of Salt . . .

MORTON'S Heat-Fag SALT TABLETS

QUICK DISSOLVING (Less than 30 seconds)
This is how a Morton Salt Tablet looks when magnified. Examine one — see how soft and porous it is inside. When swallowed whole — with a drink of water, they dissolve in less than 30 seconds.
Case of 9000, 10-grain Salt Tablets, $2.60
Salt-Dextrose Tablets case of 9000, $3.15



Place MORTON'S DISPENSERS at all Drinking Fountains
They deliver salt tablets, one at a time, quickly, cleanly—without waste. Sanitary, easily filled, durable.
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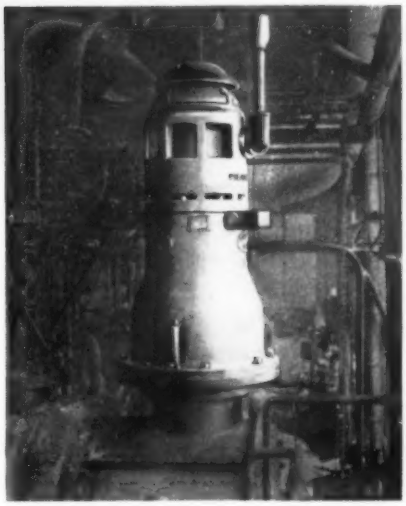
They want our recommendations for a vertical drive

Because of the completeness of the line of Philadelphia Speed Reducing Units we are able to furnish the type of drive best suited for practically any requirement. For example, the

Philadelphia MOTOREDUCER is adaptable to service where a compact, built-in motor and speed reducer is indicated. (View at right shows a MotoReduceR driving a horizontal mixer.)

Philadelphia Worm Gear Speed Reducers

are made in a vertical type for installations where it is advisable to have a separate motor and speed reducer. (Photo above shows a vertical type Philadelphia Worm Gear Reducer in a sugar refinery.) Other types of vertical Philadelphia speed reducers are also available for meeting special requirements. All Philadelphia units are made for dependable, economical and efficient operation.



Tell us your problems . . . our engineering staff will give you unbiased suggestions on the right unit for your purpose.

PHILADELPHIA GEAR WORKS

INDUSTRIAL GEARS
AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS

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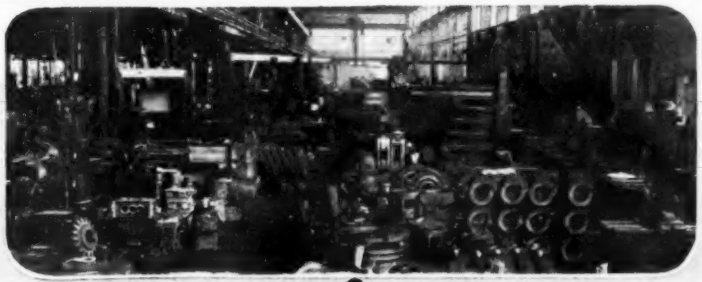
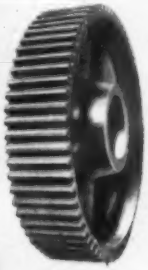
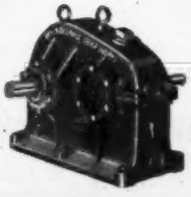


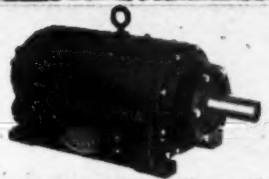
Philadelphia **LIMITORQUE CONTROL** operates all types of valves, etc., safely, economically, from convenient stations.



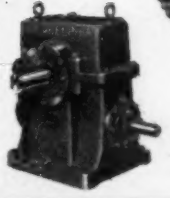
Philadelphia **GEARS** All types and sizes of industrial gears. Can be supplied in all materials.



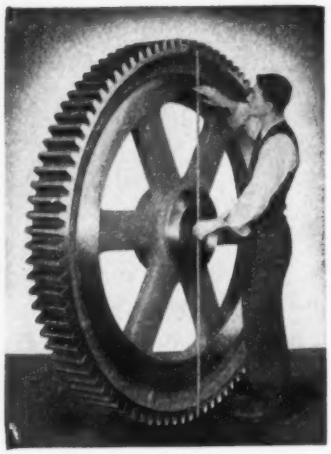
Philadelphia **HERRINGBONE SPEED REDUCER** for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.



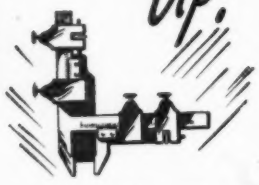
Philadelphia **MOTOREDUCER** The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.



Philadelphia **WORM GEAR SPEED REDUCER** right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.



GEARS THAT WILL *Measure Up!*



Stahl gears will measure up to every requirement you demand—in material, accuracy, workmanship and performance. In price, too, you'll find Stahl assures satisfaction because we're "geared" to produce gears to any specifications in any quantity, economically. So outline your requirements and let us quote. You can depend on Stahl for a prompt estimate and fast service.

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"When your specifications call for special gears — Spur — Bevel — Mitres — Helical — Worms and Worm Gears — Reduction Units — Why not try GRANT.

You will find GRANT service meeting all requirements on both stock and special gears."

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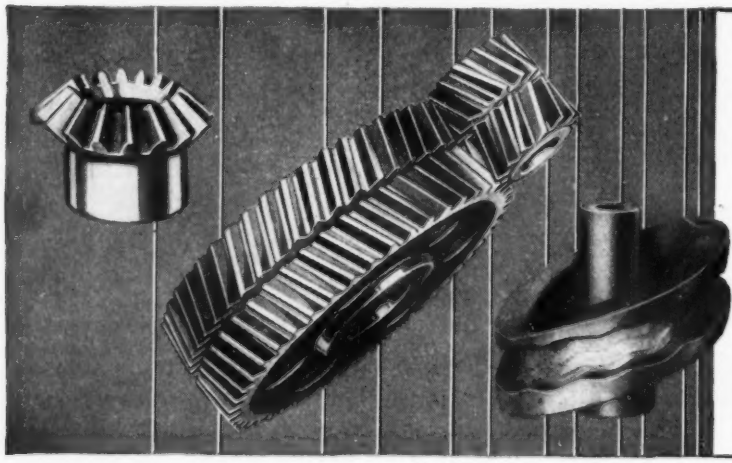

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AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD CONNECTICUT

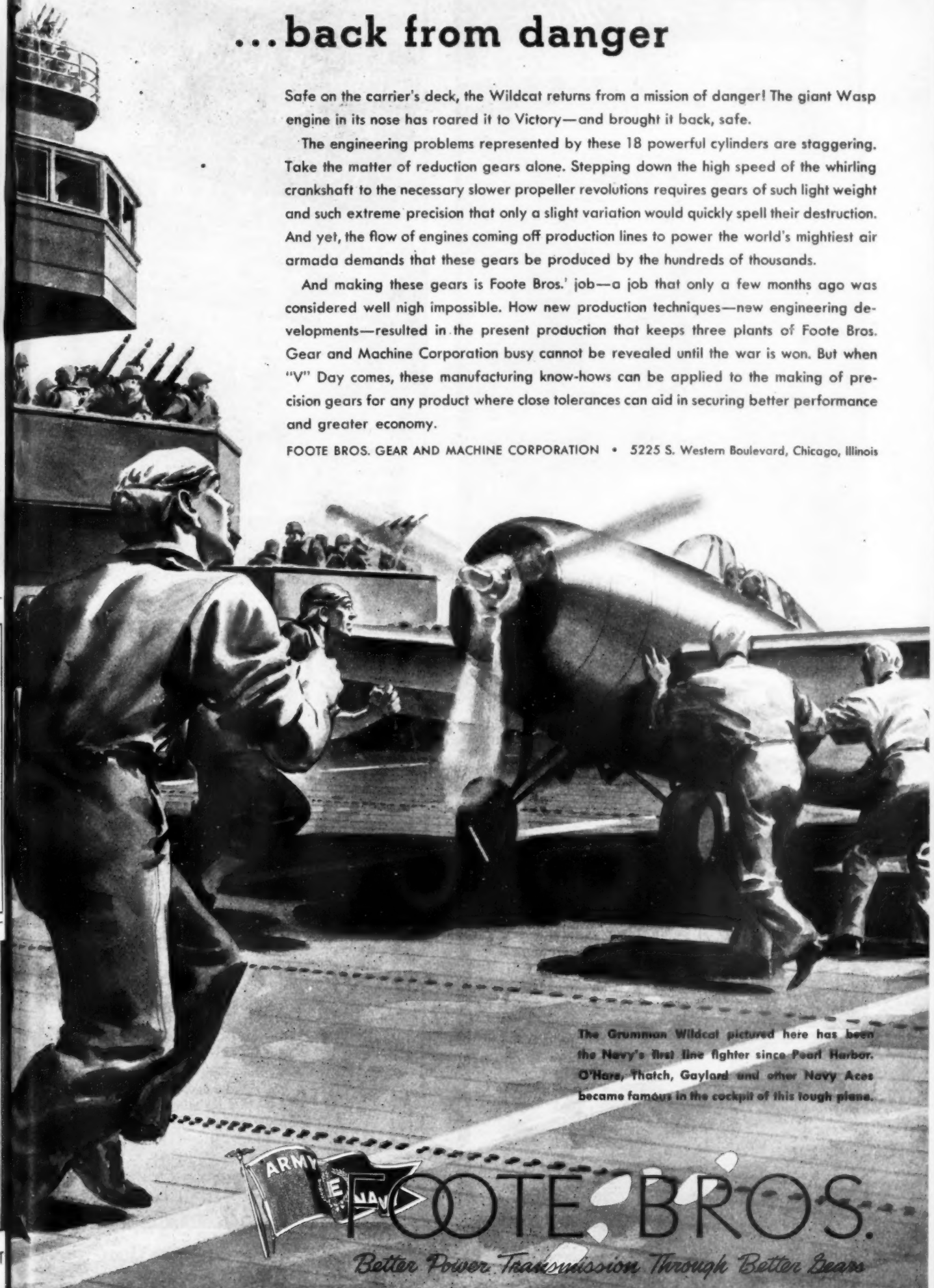
...back from danger

Safe on the carrier's deck, the Wildcat returns from a mission of danger! The giant Wasp engine in its nose has roared it to Victory—and brought it back, safe.

The engineering problems represented by these 18 powerful cylinders are staggering. Take the matter of reduction gears alone. Stepping down the high speed of the whirling crankshaft to the necessary slower propeller revolutions requires gears of such light weight and such extreme precision that only a slight variation would quickly spell their destruction. And yet, the flow of engines coming off production lines to power the world's mightiest air armada demands that these gears be produced by the hundreds of thousands.

And making these gears is Foote Bros.' job—a job that only a few months ago was considered well nigh impossible. How new production techniques—new engineering developments—resulted in the present production that keeps three plants of Foote Bros. Gear and Machine Corporation busy cannot be revealed until the war is won. But when "V" Day comes, these manufacturing know-hows can be applied to the making of precision gears for any product where close tolerances can aid in securing better performance and greater economy.

FOOTE BROS. GEAR AND MACHINE CORPORATION • 5225 S. Western Boulevard, Chicago, Illinois

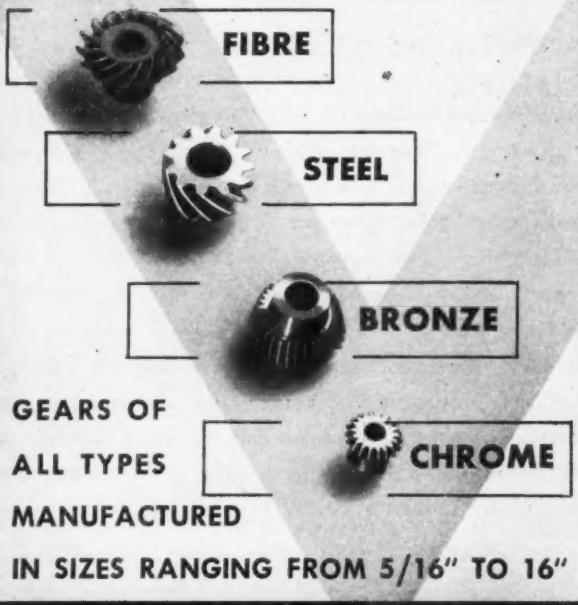


The Grumman Wildcat pictured here has been the Navy's first line fighter since Pearl Harbor. O'Hare, Thatch, Gayland and other Navy Aces became famous in the cockpit of this tough plane.

FOOTE BROS.

Better Power Transmission Through Better Gears

GEARS – *Any Material*



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Keep 'Em Running AT TOP SPEED with CINCINNATI GEARS

Give yourself every opportunity to "Keep 'Em Running". With production schedules being stepped up daily . . . Cincinnati Gears assume more and more importance to your plans. Get the "Right Gear for the Job" by using **"Gears . . . Good Gears Only"**.

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- WORM
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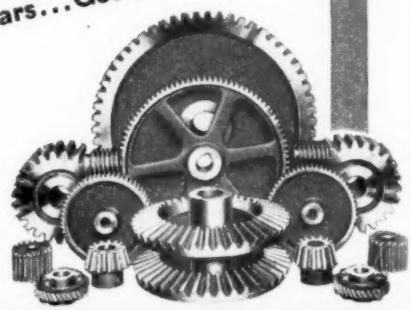

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Wooster Pike and Mariemont Ave. • Cincinnati, Ohio

For more than 40 years we have been making gears of every type and size to meet both usual and unusual requirements. Whether your needs call for spur, bevel or worm gears, it will pay you to consult with Earle engineers. Send today for the Earle Gear Booklet 42-G which contains full information.

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for War Production

SIZE 2" TO 52" DIAMETER

Send your specifications immediately with a request for our earliest delivery date.

Fast production of gears to your specifications, made possible by expanded facilities in the new Sier-Bath gear plant, enable us to quote much better delivery dates.

Precision gears of all types from 2" to 52" diameter can be produced in quantity and to Sier-Bath's 38-year high standard of quality.

Now is the time to take advantage of the extra capacity now available in the Sier-Bath plant and assurance of prompt service as a means of speeding up your war production.

SIER-BATH GEAR CO.

NORTH BERGEN NEW JERSEY

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Gear Specialties

SPURS • HELICALS • BEVELS
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This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

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The NEW "MAXITORQ"

MULTIPLE DISC DESIGN IS SIMPLY ADJUSTED and EASILY CONTROLLED

The use of separator springs between the active discs in the JOHNSON "MAXITORQUE" FLOATING PLATE CLUTCH assure quick disengaging and prevent excessive drag. Abrasion and heat common to many clutches of the multiple disc type are absent in the "MAXITORQ."

Double

This new development by Johnson is provided with a very simple manual adjustment so that smooth operation can be maintained under all power transmission requirements. Sensitive starting, safety and quietness are other advantageous operating features.

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Made in capacities from ½ HP to 5 HP at 100 R.P.M. in single, double and cut-off coupling types. WRITE FOR DIMENSION SHEETS covering all sizes and types.

Write for Multi-Disc clutch catalogue No. 53 or consult Sweet's or Thomas' Reg.

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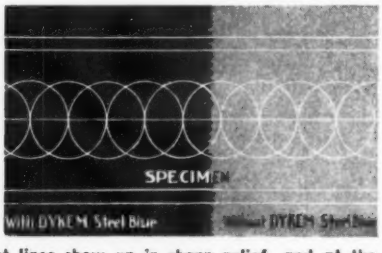
simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.



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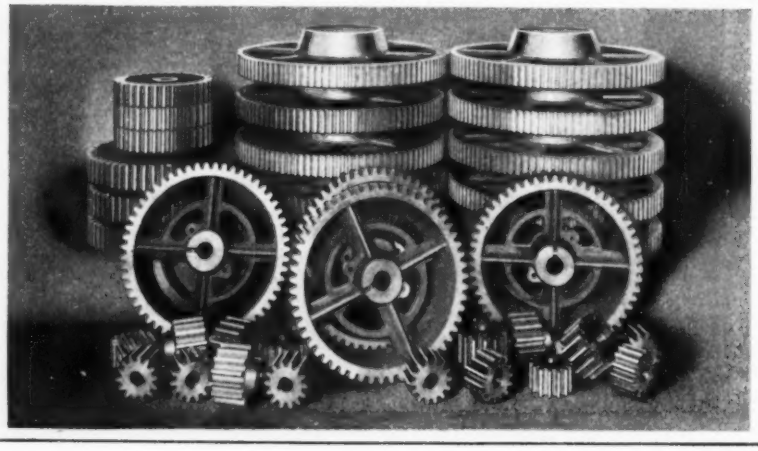

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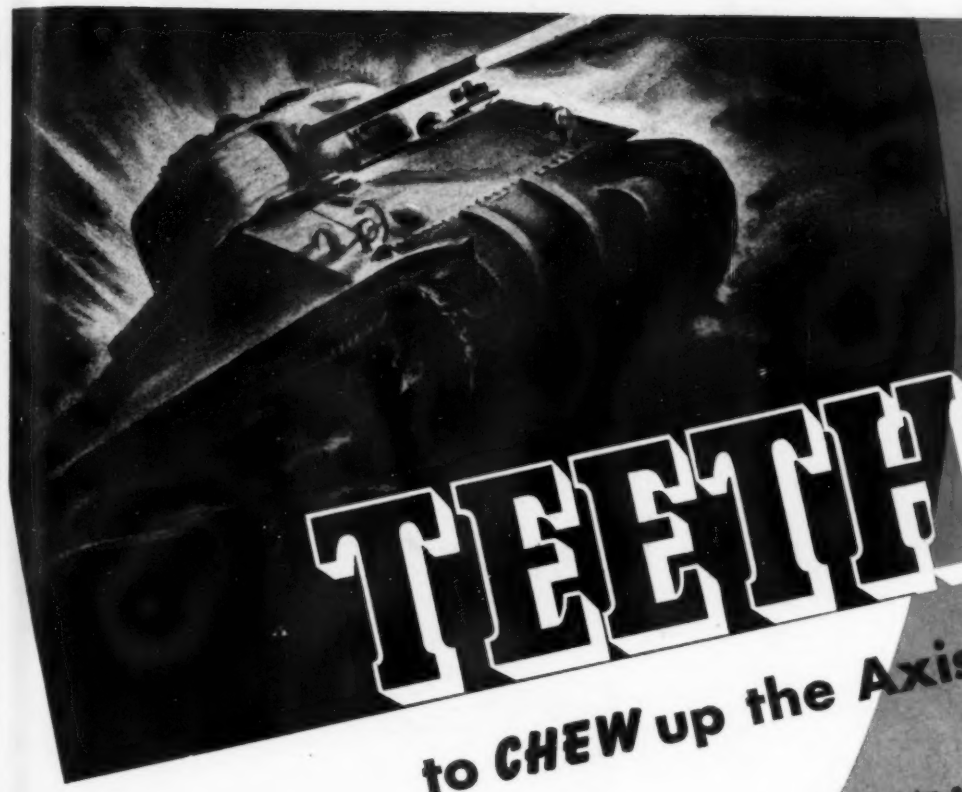

TEETH

to CHEW up the Axis

Perkins Precision, Custom-Cut Gears are helping to power planes, tanks and many other tools which are urgently needed by the armed forces of America.

Perkins Gears meet Government specifications in every respect, because this organization has the engineering ability and the equipment necessary to meet the high standards set by the Government.

If you need precision gears in your production or are designing armament which would be improved by the use of precision gears, consult with our engineering staff.

PERKINS PRECISION *Custom-Cut* GEARS

PERKINS MAKES

HELICAL GEARS
WORM GEARS
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PERKINS MACHINE AND GEAR COMPANY

SPRINGFIELD, MASSACHUSETTS

"THROW YOUR SCRAP INTO THE FIGHT"

STEELED for the Knock-out Drive

"ALLENS"

— like our spearhead commanders, pack the qualities of tested steel. In men it's mettle, in screws it's metal but the two are one in beating opposing forces. In machines of war *or* production, the forces opposed to hollow screws are mechanical shocks, violent stresses, vibration. By strength of material, by special processes of forming, by accurate threading, "ALLENS" uphold the invincible Quality that gets our fire-power to enemy capitals — *via the Knock-out Drive!*

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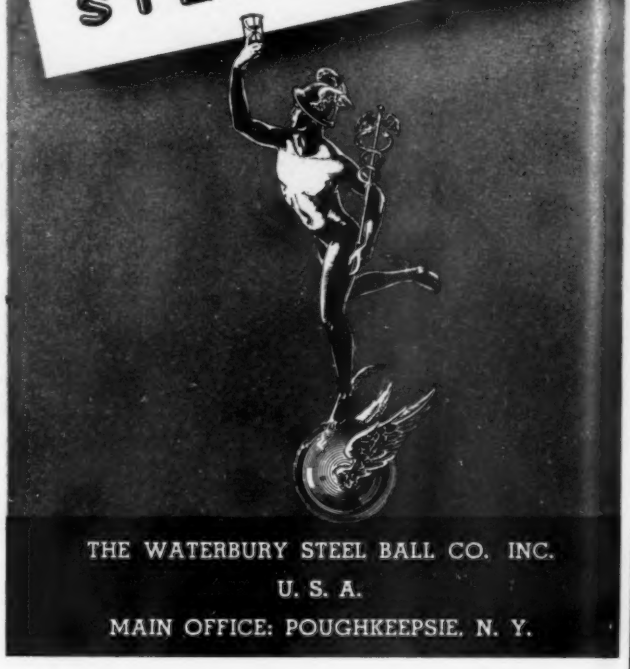
WATERBURY STEEL BALLS



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For SPEED, ACCURACY and CLOSE TOLERANCE Assembly and Inspection—

Production methods today demand streamlined efficiency in men, machines and tools. Surface plates of precision accuracy must contribute, as never before, to unparalleled accuracy in production and of these the Smith Master Surface Plate is an outstanding example. Plants engaged in aircraft and ordnance production throughout the country have expressed their complete satisfaction by frequently reordering. For your sensitive, precise and accurate inspection depend on Smith Master Surface Plates. Prompt delivery on a large variety of standard sizes up to 48"x96". For prices and delivery wire, phone or write.

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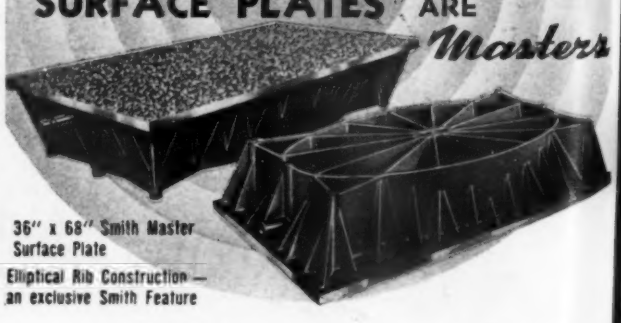
Smith Master SURFACE PLATES ARE Masters



36" x 68" Smith Master Surface Plate
Elliptical Rib Construction — an exclusive Smith Feature

If you care about better V-Belt performance

MAKE *this* SIMPLE TEST!

What Happens When a V-Belt Bends

FIG. 1

FIG. 2

433

Take any V-belt that has *straight* sides. Bend that V-belt while you grip its sidewalls between your fingers and your thumb—as shown in the large photograph above. As the belt bends, you will *feel* its sides *bulge out*—as shown in figure 1 on the left.

Now do the same thing with a belt that is built with the patented *Concave* side. You get a similar change in sidewall shape—but what a *different result!* The precisely engineered Concave side becomes perfectly *straight*—as shown in Figure 2. This belt, when bent, exactly fits its sheave groove. There is no side-bulge.

Two savings result. FIRST:—The full side of the belt *uniformly* grips the sheave-groove wall. This means *uniform wear—longer life!* SECOND:—The full side-width grip on the pulley carries heavier loads without slippage. This saves belts and power, too!

Only belts built by Gates are built with the Concave side, which is a Gates patent.

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

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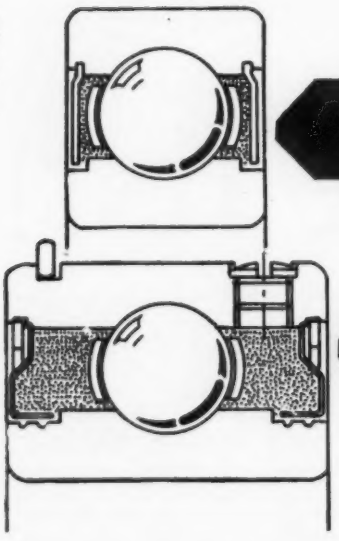
YOU CAN'T GET A QUART INTO A PINT MEASURE



And, "by the same token," you can't get as much grease into a single-row-width "sealed" ball bearing, as goes into the double-row-width "CARTRIDGE" BALL BEARING of equal bore and outside diameter. Look at the section drawings herewith, and you'll see why.

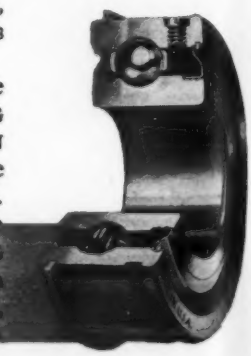
In the single-row-width shielded or "sealed" bearing, see that very small grease space inside the sealing plates. Note further that there is no space available for a highly-efficient, truly grease-tight seal.

Now, in contrast, see that big grease reservoir between the seals, in the "CARTRIDGE" BEARING section—providing at least DOUBLE THE GREASE CAPACITY of the shielded or "sealed" bearing, and greatly extending the greasing intervals. Note, too, how the wide, inwardly-extending seal flanges, and the oil grooves on the inner ring, provide AN IDEAL SEAL THAT PREVENTS THE ESCAPE OF GREASE AND EXCLUDES DIRT, whatever the shaft angle.

Furthermore, the "CARTRIDGE" SEALS ARE REMOVABLE AND REPLACEABLE, should you wish to inspect the bearing or change the grease. And the refilling plug makes it easy to put in a new charge of grease. You can't do this, with the ordinary shielded or "sealed" bearing, which is permanently sealed.

QUALITY, too, is just as vital as QUANTITY, in the grease in your bearings. So, every "CARTRIDGE" BEARING leaves our factory, packed with NORMA-HOFFMANN "STABILITY-TESTED" GREASE, which has great resistance to oxidation as well as excellent lubricating properties.

Summing up . . . all these distinctive features of the NORMA-HOFFMANN "CARTRIDGE" BALL BEARING mean prolonged bearing life, less lubrication attention and lower maintenance cost. Write for the Catalog, enumerating many additional advantages. Let our engineers work with you.



NORMA-HOFFMANN

"CARTRIDGE"

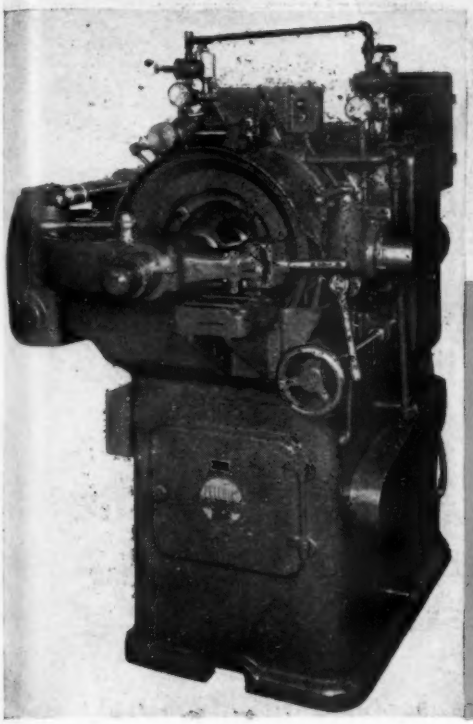
BALL BEARING

NORMA-HOFFMANN BEARINGS CORP'N, STAMFORD, CONN. • FOUNDED 1911

TO WIN THE WAR: *Work—Fight—Buy War Savings Bonds!*

Providing Smooth, Chatter-free Operation for

FELLOWS GEAR LAPPING MACHINES

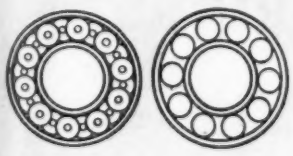


First requirement of a lapping machine is utmost evenness of running to prevent irregularities. In this Fellows LS type Gear Lapping Machine, the internal lap head is mounted on a 17" dia. Orange Staggered Roller assembly, which provides the smooth-running accuracy demanded by the external gear lapping operation performed on this machine.

ORANGE "STAGGERED" ROLLER BEARINGS

GREATER LOAD CARRYING CAPACITY

Orange Staggered Roller Bearings provide that rare combination every engineer looks for—extreme ruggedness, plus smooth, even, precision operation. The staggered roller arrangement distributes the load over a multitude of short rolls, rather than over a few full length rolls, as in conventional types.



Shown above are end views of an Orange Staggered Roller Bearing and a conventional roller bearing. Note how staggered design brings maximum roller surfaces in contact with the load.

This multiplicity of contact points within the loaded zone, insures an even-running bearing of greater load carrying capacity, enabling Orange Staggered Roller Bearings to do the work of larger conventional bearings . . . and to stand up longer under severest conditions. Full range of standard types. Special sizes to order. Write for Engineering Data Book.

Mail Coupon for Engineering Data

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Orange, N. J.

Please send Staggered Roller Bearing Data Book.

Name ..... Title .....

Company .....

Address .....

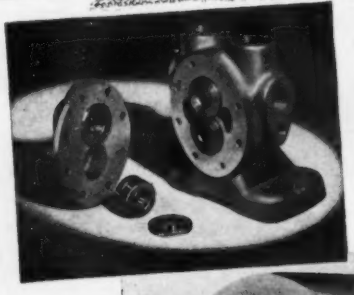
City ..... State .....

ORANGE ROLLER BEARING CO., INC.
ORANGE • NEW JERSEY

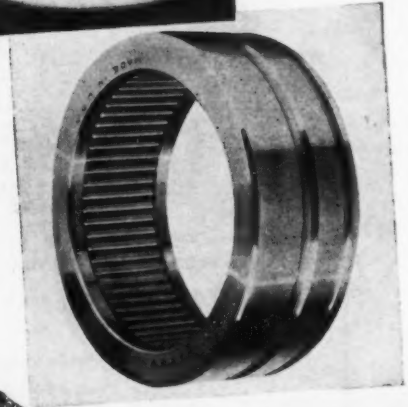
This is the GUN that CENSORED Built

These are some of the ROPER *Rotary* PUMPS

which, in its manufacture, supplied the liquid that cooled the bore of the gun that (censored) built.



And this is one of the RBC CYCLOPS ROLLER BEARINGS

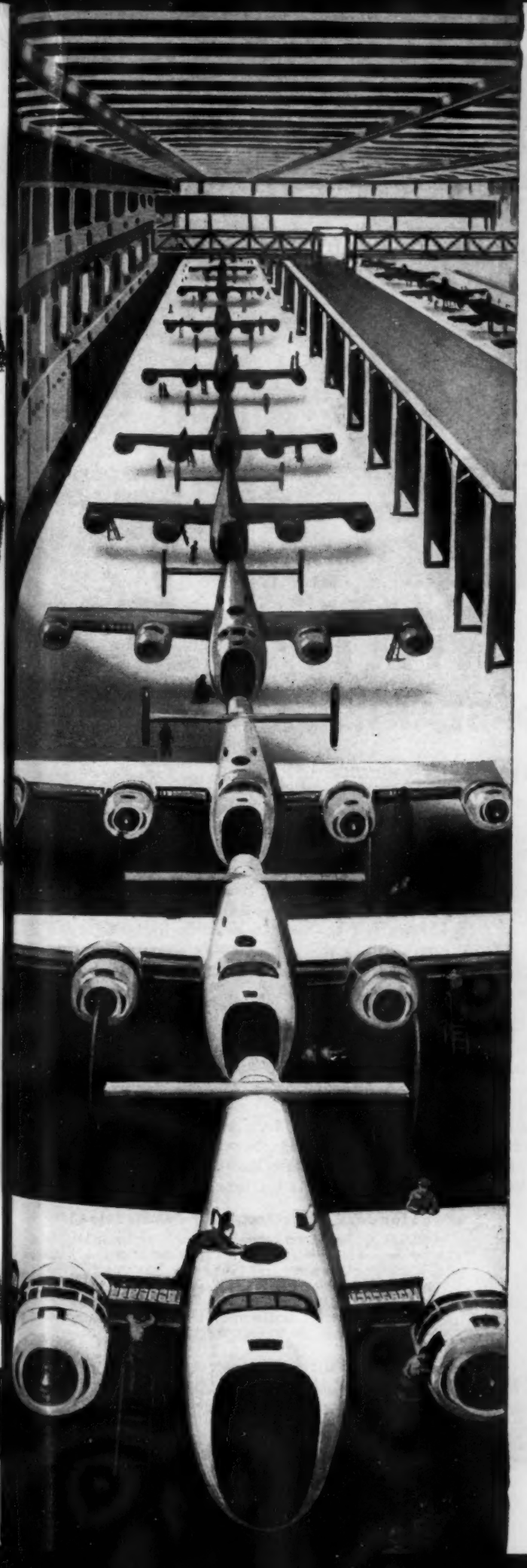


that reduced the friction of the pumps which supplied the liquid that cooled the bore of the gun that (censored) built.

We quote Geo. D. Roper Corp., "RBC Needle Bearings are used in all Series "H" pumps . . . Entire load is evenly distributed on the 4 large bearings each new Roper boasts. These bearings — 2 on each side — are selected and designed to adequately handle peak loads — lengthen life of pump."

ROLLER BEARING CO. of AMERICA

TRENTON . . . . NEW JERSEY



DeWALT

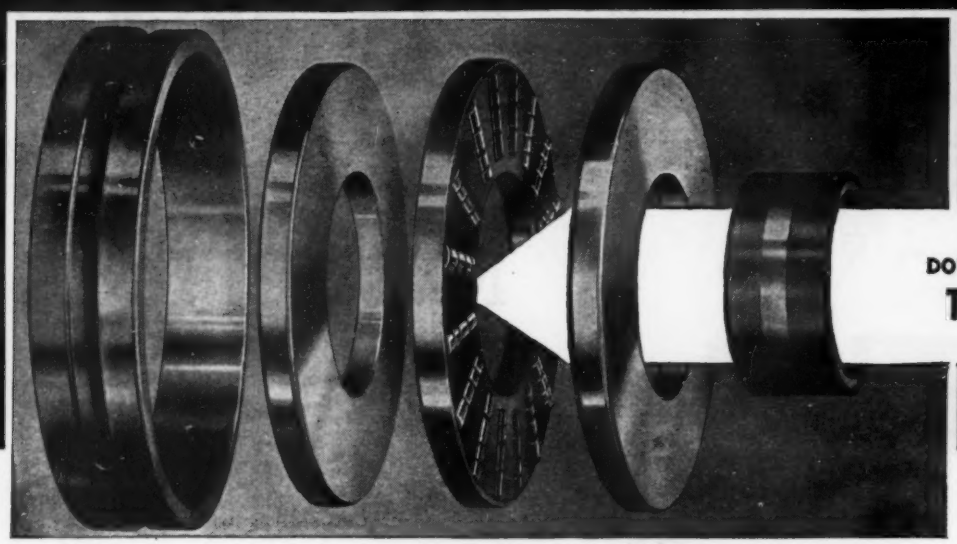
CUTTING MACHINES help speed deliveries

Off the assembly lines they move with record-breaking speed, more and more fighters, bombers, transports and gliders. There—in the background—are DeWalt Cutting Machines supplying the speed and accuracy so essential, increasing volume, saving man-power. Sturdy, flexible, dependable—these machines do their work with a precision heretofore unknown.

DeWALT PRODUCTS CORPORATION
LANCASTER PENNSYLVANIA

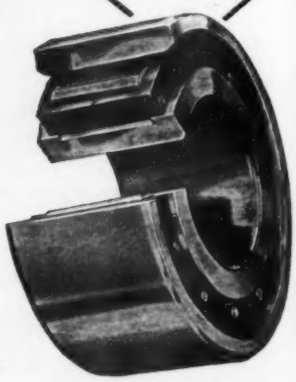
CUTTING MACHINES

When Every Machine Must Do 3 Machines' Work!



*Type SDT
DOUBLE ACTING
THRUST

*Type MCS
DOUBLE
WIDTH
RADIAL



These simpler ROLLWAY
RIGHT-ANGLED BEARINGS

hold "down time" losses to a minimum . . .

For longer bearing life, more efficient performance and more economical maintenance . . .

FOLLOW THIS BASIC BEARING PRINCIPLE

- All radial loads carried at right angles to the roller axis.
- All thrust loads carried at right angles to the roller axis.

Not one shift, not two shifts, but THREE SHIFTS A DAY! That's the three-machine load your equipment must handle today. No wonder bearing wear increases. No wonder old-time service factors fail to predict bearing life. But even with this tripled operating time, there's a way to carry bearing loads that will make your bearings stand up longer. Here's the fundamental principle to follow:

Right-Angled Bearings Simplify the Load

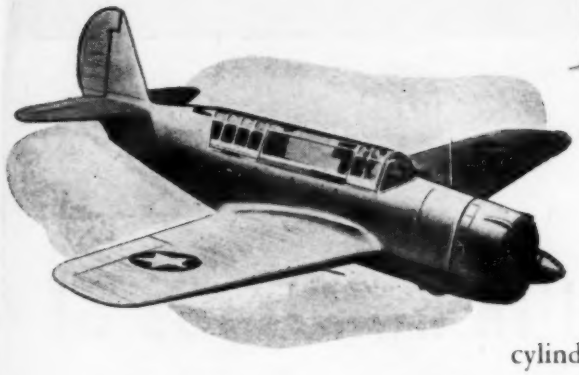
Because they carry every load at right angles to the roller axis, Rollway Right-Angle Bearings split the load into its two simple components of *pure radial* and *pure thrust*. Only one of these loads is carried by a single bearing assembly. There are no oblique resultants, no compound pressures on the rollers. Magnitude of the stresses is considerably reduced. Life of the bearing is substantially increased. And machines can be run under heavier loads for longer periods.

Standard Sizes For Most Applications

S.A.E. or American Standard metric dimensions and tolerances are available for most applications . . . in a wide range of sizes and types that are "engineered to the job." Let Rollway's specialized bearing experience help you. Send your design or change-over specifications for free, confidential bearing analysis and recommendation. No obligation.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, NEW YORK

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 **BEARINGS**



Helping aviation forge ahead!

When the forged aluminum alloy aircraft engine cylinder head was developed to replace the cast type head —another revolutionary advance was made in aviation. Not only did this step up aircraft production—but it gave to the planes of the United Nations a decided superiority in combat—in speed, altitude, load and range.

Milling the fins on this new type head constituted a difficult problem. But Disston Engineering, in cooperation with the airplane motor manufacturer, solved it with a Carboloy-fitted saw—a saw which cuts the fins with hitherto unheard of accuracy and speed.

It is significant that this accomplishment in fine toolmaking belongs to Disston alone. It is as exclusively a Disston achievement as the top quality and craftsmanship *you* enjoy in such standard tools as Disston wood and metal cutting saws, files, hack saw blades, machine knives . . . and steel. Moreover, to this extra quality in tools Disston adds expert, practical advice on tool operation—with 34 different Conservation Control instruction cards—supplied *free*.

Disston tools and Disston cards will save priceless man-minutes in your plant. Let us tell you how. Write Henry Disston & Sons, Inc., 520 Tacony, Philadelphia, Pa., U.S.A.

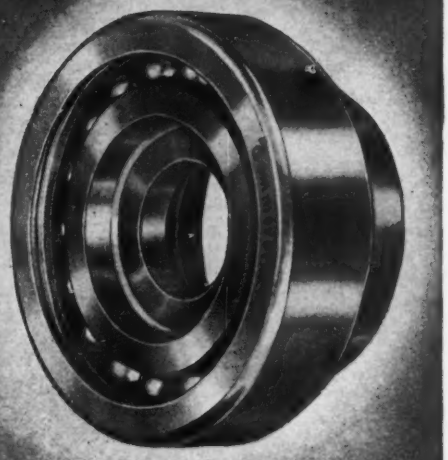
DISSTON

ESTABLISHED 1840

REG. U.S. PAT. OFF.

Disston skill and experience in many precision operations are required to make this vitally important Fin-cutting Saw for forged aluminum alloy cylinder heads . . . The same painstaking care and skill go into the manufacture of such other Disston products as Solid and Inserted Tooth Milling Saws; Band Saws; Carboloy-fitted Circular Saws for non-ferrous metals; and Tool Bits.

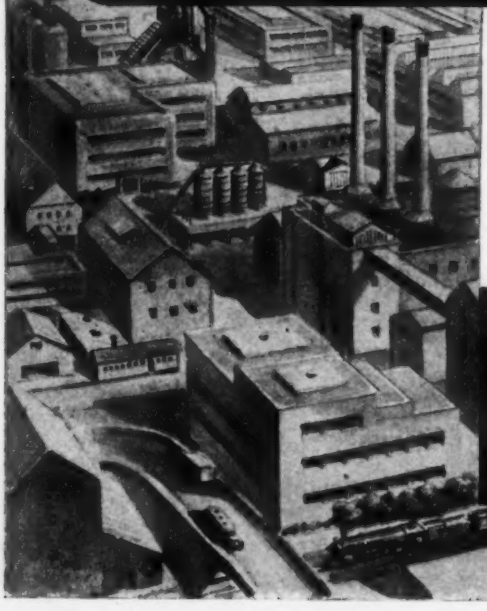
Conserve Man-Minutes and help win the war



Used in hundreds of different industries and products...

"Commercial"

ANNULAR BALL BEARINGS



FOR THE DURATION, WE ARE UNABLE TO SUPPLY MANY TYPES OF BEARINGS FORMERLY MANUFACTURED

THE SCHATZ MANUFACTURING CO.
U. S. A.
REPRESENTATIVES LOCATED AT
Detroit: 2640 Book Tower • Chicago: 902 S. Wabash Ave.
Cleveland: 402 Swetland Bldg. • Los Angeles: 5410 Wilshire Blvd.

Fighting Companions—

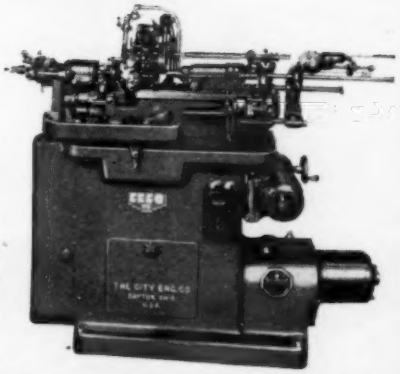
Every gun crew has a number of fighting companions whom you never see. They are the incredibly accurate precision controls which give mechanical eyes, ears and brains to our land, sea and sky defenders. Today Ceco Automatic Screw Machines are helping to turn out faster, and more economically, hundreds of extremely accurate small parts used in the manufacture of these vital military instruments, controls and accessories. And until Victory, we can think of no better way for Cecos to serve America at war.

CECO PRODUCES THIS COMPLETE PIECE IN *ONE* OPERATION INSTEAD OF *THREE*

An example of Ceco's ability to speed production is this burr. Formerly its production required three operations. Ceco turns the piece, forms the ball and mills the flat *all in one operation*—and does it faster than a single operation was handled previously.

CECO IS AVAILABLE IN ⅜" AND ½" BAR CAPACITY WITH 4 OR 5 RADIAL TOOL SLIDES

The CECO 3-8 illustrated has four Radial Tool Slides with bar capacity of ⅜" diameter and a turning length of 1½" with flat cam and 2¾" with bell cam. Master Speed Ranger varies Spindle speed from 675 to 6100 r.p.m. at the turn of a handwheel. And for simplicity, CECO's Precision Roller Bearing Spindle is always in adjustment and its Constant Rise Feeding Mechanism gives more accurate feeding.



FROM BAR STOCK TO FINISHED PIECE IN ONE OPERATION CAME THESE TYPICAL CECO-MADE PIECES

WRITE FOR COMPLETE ILLUSTRATED DATA

CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES

Engineered and Manufactured by
THE CITY ENGINEERING COMPANY
Dayton, Ohio

Since 1909, Designers and Builders of Tools, Dies, Fixtures and Special Purpose Machinery.

NO. 2 AMERICAN PLAIN MILLING MACHINE . . . . designed and built to meet modern requirements in speed and accuracy

PROVIDING:

Heavy, accurately ground spindle running in heavy phosphor bronze bearings compensated for wear. Standardized No. 40 taper spindle nose.

Infinite spindle speeds—from 25–500 R.P.M.—obtained instantly while machine is in operation by a single direct reading dial within easy reach of operator.

U. S. Vari-Drive ball bearing motor located in base with magnetic push button control drives spindle through TWIN-DISC Duplex Machine Tool Clutch and multiple V-belt.

CONDENSED SPECIFICATIONS

Table Working Surface—46" x 10½"
T-Slots—three 11/16"
Longitudinal Power Feed—25"
Range per Rev.—.005" to .212"
Transverse Power Feed—9"
Vertical Hand Feed—19"
Feeds (geared)—16

Send for complete details

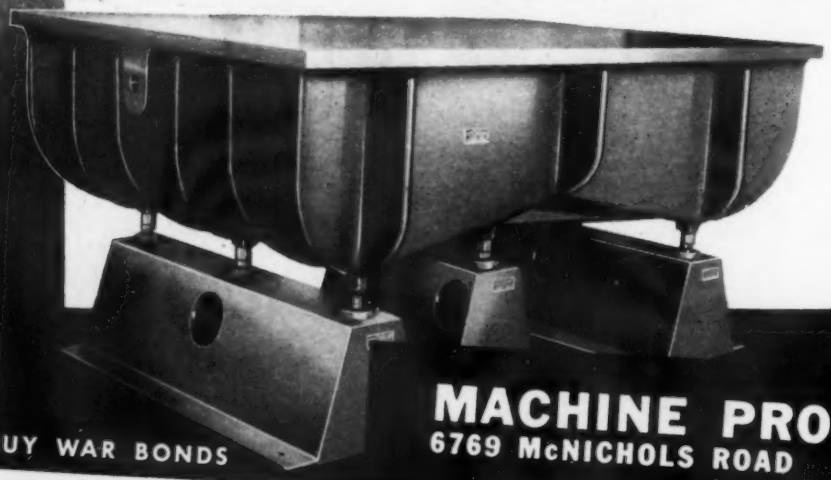
J. L. LUCAS & SON, Inc.
Bridgeport, Conn.

Prompt deliveries with high priorities

. . . and Now

A SURFACE PLATE FOR EXTREMELY HEAVY LOADS

Originally designed and built for a large aircraft motor manufacturer—now available to you. • Surface measures 4 x 6 ft.—depth 20 inches—weighs over 2 tons—the heaviest plate, of these surface dimensions, ever made. Made of Meehanite—recognized for its uniform strength and fine grain structure—meets exacting requirements throughout entire surface. • Mounted on specially designed pedestal type bases—provided with 3 adjustable bearings, supplemented by additional adjusting screws for leveling purposes. • Send for folder showing other sizes and prices.



BUY WAR BONDS

MACHINE PRODUCTS CORP.
6769 McNICHOLS ROAD • DETROIT, MICHIGAN

Over-Zealous Workmen

CAN'T PREVENT THE TRIP!

AMBIENT TEMPERATURE WILL NOT AFFECT ITS PERFORMANCE

Incorporated in the many features of the Thermaload V is the exclusive Monitor Compensated Overload Relay. It assures perfect starter operation, gives positive motor protection, regardless of installation characteristics and ambient temperatures. Whether your motors operate in boiler room heat or sub-zero cold—the trip always occurs within the same time at a given percentage of overload.

OTHER FEATURES!

Vertical, Straight-Line Design; Double-Break, Silver Contacts; Easily Interchangeable Coils; Resilient, Shock-Proof Mounting.

Available in--1.3 to 7.5 H.P.--110 to 550 Volts (A.C.) and in combination units. All sizes carry the Underwriters' Seal of Approval.

This Monitor

COMPENSATED OVERLOAD RELAY

GIVES YOU "TAMPER-PROOF" MOTOR PROTECTION

Built into the Thermaload V Solenoid Starter, the Monitor overload relay gives you a *further* safeguard for your almost irreplaceable motors—the reset button cannot be blocked in by operators who are inclined to exceed the "safety-factor" in these days of speeded-up production.

The reset button must be pushed in and then *released* before contact is made. "Blocking the overload" is thus prevented!

Ingenious? Yes . . . but typical of Monitor design . . . to give you the utmost in motor protection. Specify the Thermaload V for original equipment and replacement.

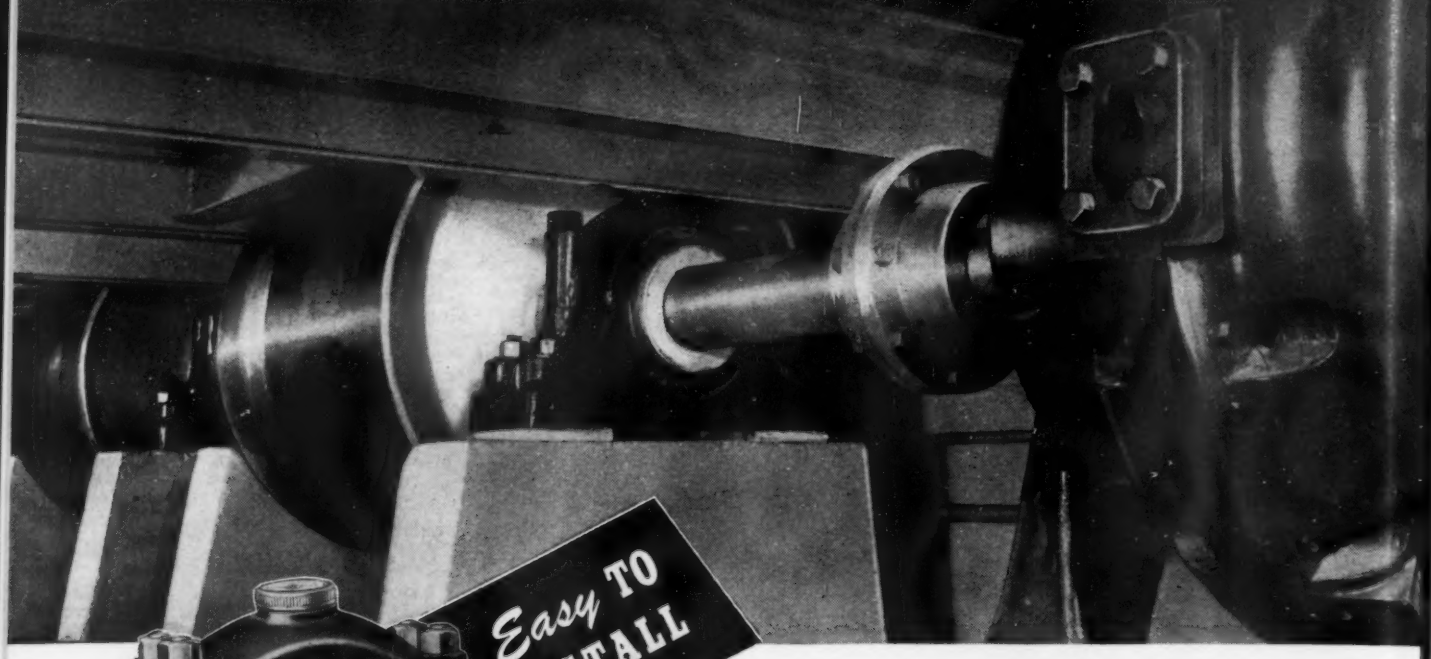
Write manufacturer or your Monitor field engineer for technical data and installation details.

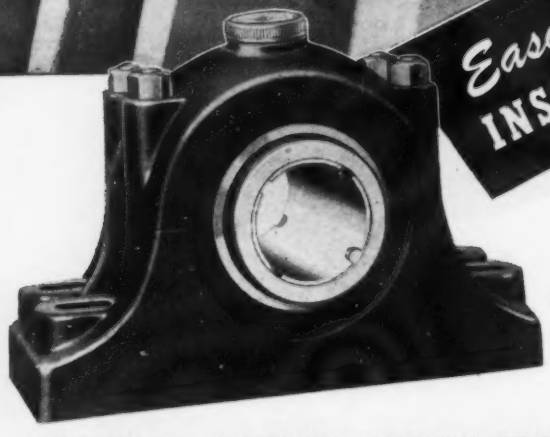
The Monitor Controller Company

GAY, LOMBARD & FREDERICK STS. BALTIMORE, MARYLAND

RUGGED DODGE-TIMKEN BEARINGS

get more *Battle Power* out of *Horsepower*



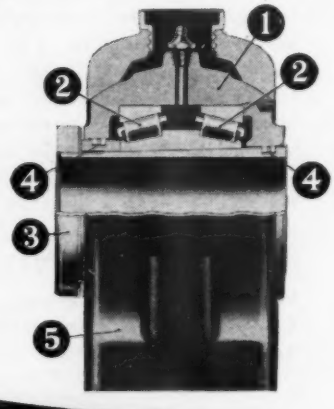


Super-rugged . . . Dodge-Timken bearings have what it takes to withstand the "beatings" bearings get in today's 168-hour weeks of war production. Completely assembled . . . ready for instant installation . . . capable of 30,000 hours of service . . . pre-lubricated for 50-million revolutions under normal conditions without relubrication . . . sealed against admission of dirt or leakage of lubricant. They eliminate maintenance delays . . . conserve vital man-hours and critical materials . . . speed peak production.

Advantages of DODGE-TIMKEN SPECIAL DUTY BEARINGS
1—Full ball and socket self-alignment . . . guards against power waste and wear. 2—Timken tapered roller bearings give full radial and thrust load capacity . . . put full power in production. 3—Easy to install—simply slip over shaft and tighten collar. 4—Piston ring seals retain lubricant and exclude dirt. 5—Rugged outer housing gives over-all protection to bearing.

Contact Local Dodge Distributor or write to

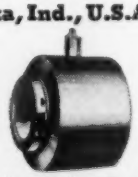
DODGE MANUFACTURING CORPORATION, Mishawaka, Ind., U.S.A.



Dodge-Timken Special Duty Ball-and-Socket Pillow Block

Dodge-Timken Special Duty "D" Unit Mount

Dodge-Timken Special Duty "S-1" Unit Mount

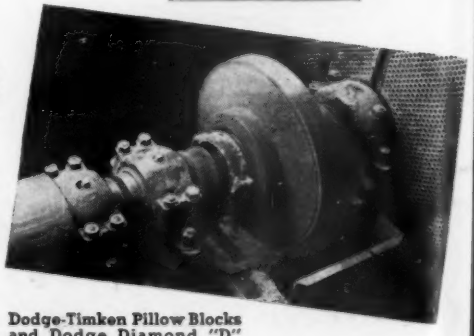


Dodge-Timken Special Duty "B-1" Unit Mount

DODGE
MISHAWAKA

THROW ALL YOUR SCRAP INTO THE FIGHT! . . . BUY MORE WAR BONDS!

THE RIGHT DRIVE FOR EVERY JOB



Dodge-Timken Pillow Blocks and Dodge Diamond "D" Clutch . . . dependable operation . . . low maintenance.

PUT *ALL* YOUR POWER IN THE JOB

HERE'S WHY I CAN SET UP A JOB *Faster* ON THE GREENLEE SCREW MACHINE!

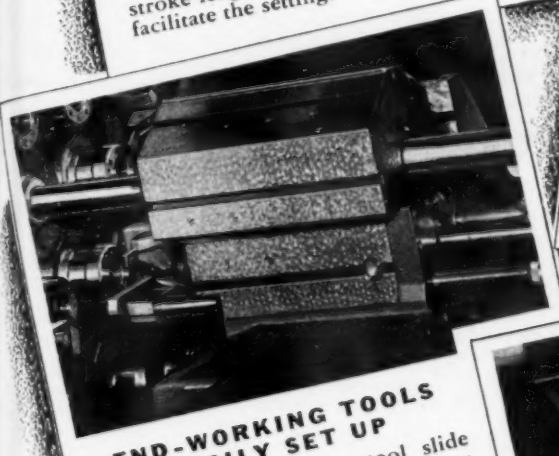
★ More production time on a job is probably lost in downtime for setting up and changing over than for any other single reason. But setting up a job on the Greenlee is such an easy, simple matter that very little production time is lost. Here are just a few of the reasons why setting up is so much easier and faster on the Greenlee.

NO CAMS FOR END-WORKING SLIDE

No valuable time wasted changing tool-side cams on the Greenlee. The end-working tool slide is operated by an intermittent-gear-and-rack mechanism. The working position of the forward stroke is controlled by an adjustable dog on the worm wheel. Setting the tool slide stroke is simply a matter of setting the dog to the selected stroke. A pointer is provided on the dog, and graduations for the various stroke lengths are on the worm wheel to facilitate the setting.

QUICK, EASY CROSS-SLIDE TOOL ADJUSTMENT

Changing and adjusting cross-slide tools on the Greenlee is simple and easy. After loosening the tool-holder clamp, the operator makes the final, precise adjustments by turning the three fine-thread screws at the rear of the slide, which moves the tool-holder in any desired direction.



END-WORKING TOOLS EASILY SET UP

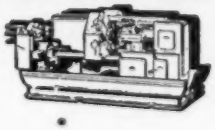
The sturdy end-working tool slide has a broad base with 7 T-slots in as many different surfaces for mounting end-working tools. The tool-holders are fastened in place by T-bolts and tongues which fit accurately in the T-slots, making a simple, rigid connection.

SIMPLE CROSS-SLIDE CAMMING

Separate cams, quickly interchangeable, move each heavy, forged-steel cross slide independently on the Greenlee. These small, compact cams, easily removed and changed, save set-up time and eliminate special camming for each job.

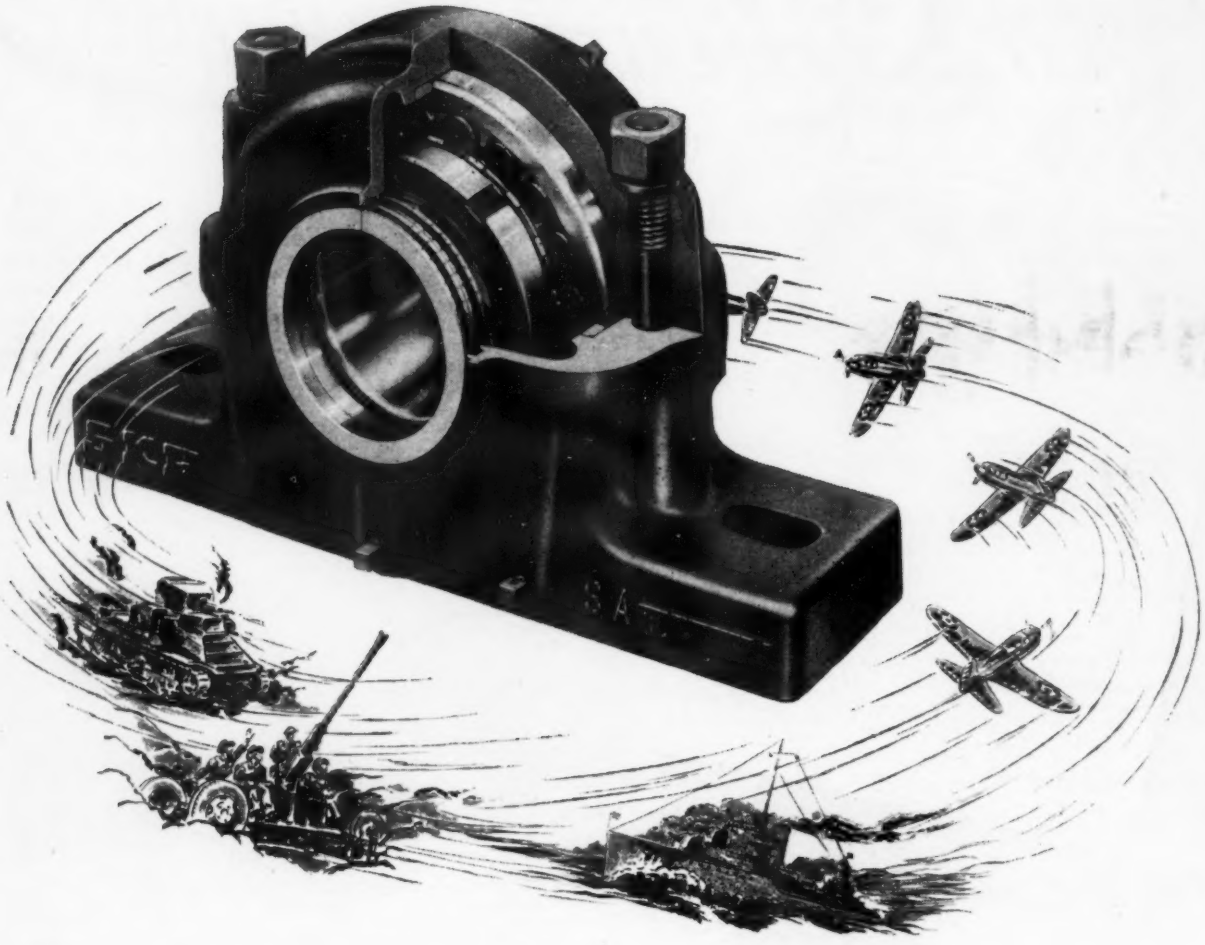
GREENLEE BROS. & CO.

1730 MASON AVENUE ROCKFORD, ILLINOIS



ASK THE OPERATOR WHO RUNS ONE . . .

MORE POWER FOR *America*



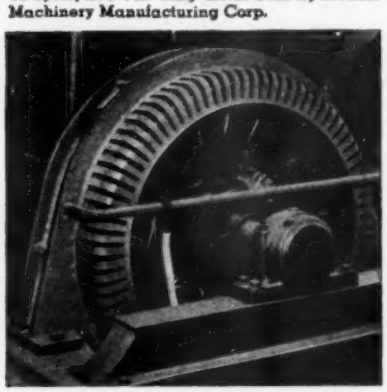
All the mighty power that America wields with guns, tanks, planes, and battleships comes from millions of tiny sources. Sources of day-and-night working machines . . . of smoothly rolling shafts . . . of carefree bearings in rugged SKF Pillow Blocks that guard them by retaining lubricant and stopping the entrance of injurious material. Easy installation, inspection, and lubrication are certain with these well-designed pillow blocks. And their exclusive SKF Triple Seals block all efforts of dirt and water to reach bearings on shafts ⅝" in diameter and up. Their presence on a machine or a lineshaft is a move toward Victory. 5261

SKF INDUSTRIES, INC., PHILADELPHIA, PA.

SKF

PILLOW BLOCKS

● SKF Pillow Block helping to build America's power on a 125 h.p., 360 r.p.m., 3-phase, 60-cycle, 208 volt unity motor built by Electric Machinery Manufacturing Corp.



IN AMERICA'S GREAT PRODUCTION PLANTS..

Acme-Gridley Automatics are helping to produce Timken Bearings of high precision standards, working the toughest steels at speeds limited only by what tools will stand.

Precision-plus SPEED!

Helping other manufacturers make things better, cheaper, quicker than they have ever been made before—that's our business.

The bearing races made by Timken, on Acme-Gridley Automatics, are uniformly accurate and machined to tolerances that are new to mass production methods. For example, the 7" diameter bearing part shown above is machined from tubing in 1/10th the time formerly required by single spindle methods.

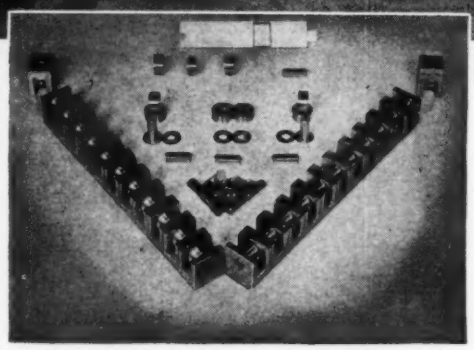
This speed in precision manufacture is certain to be an important factor in turning out better postwar products, at costs that will challenge competition.

THE NATIONAL ACME CO.

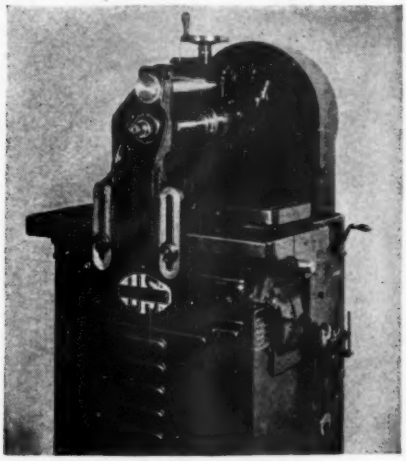
170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • SCREW MACHINE PRODUCTS • THE CHRONOLOG • LIMIT SWITCHES • POSITIVE CENTRIFUGE • CONTRACT MANUFACTURING

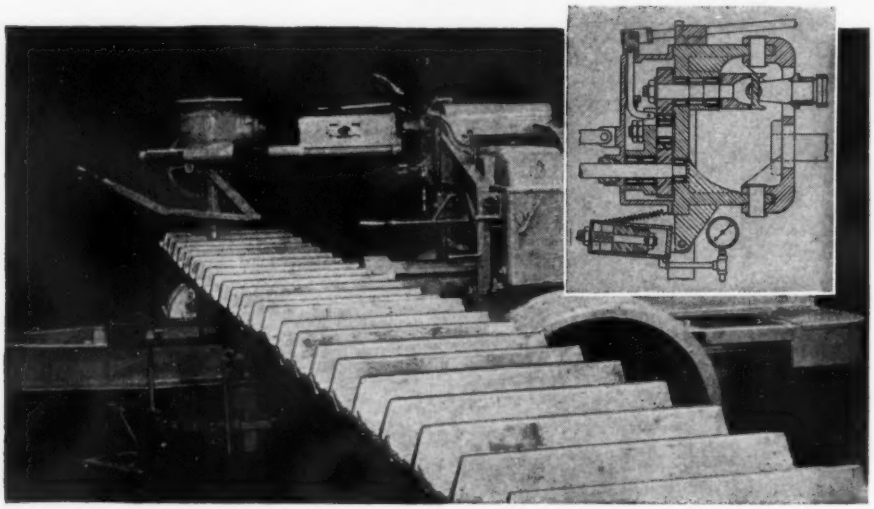
SIMPLER, MORE EFFICIENT PRODUCT DESIGN AND ASSEMBLY is often achieved by the use of special types of bearings such as these Bantam Journal Roller Bearings built for use in the crown and traveling blocks manufactured by Emsco Derrick & Equipment Co. Measuring 27½" O.D. they are provided with thrust shoulders built into outer races to eliminate hazardous thrust washers and contribute to compact design. Bantam's engineering and manufacturing facilities are geared for the prompt delivery of such special bearings for essential purposes.



"SEWING" SHEETS OF STEEL together rapidly with dependable welds to speed shipbuilding is the work of The Linde Air Products Company's "Unionmelt" welding machine. Special anti-friction bearings built by Bantam are used on the pressure and straightening rollers which feed the welding rod. These bearings, shown unassembled in the inset above, assure long, trouble-free service and are typical of Bantam's ability to provide bearings for special applications of all types.



LOW STATIC FRICTION of a Bantam Quill Bearing aids in actuating a safety-stop device on the cam-feed mechanism in this U. S. Tool Company "Multi-Miller," by allowing a normally stationary high-friction bearing on the camshaft and inside the Quill Bearing to turn when pressure on the shaft approaches the overload point.



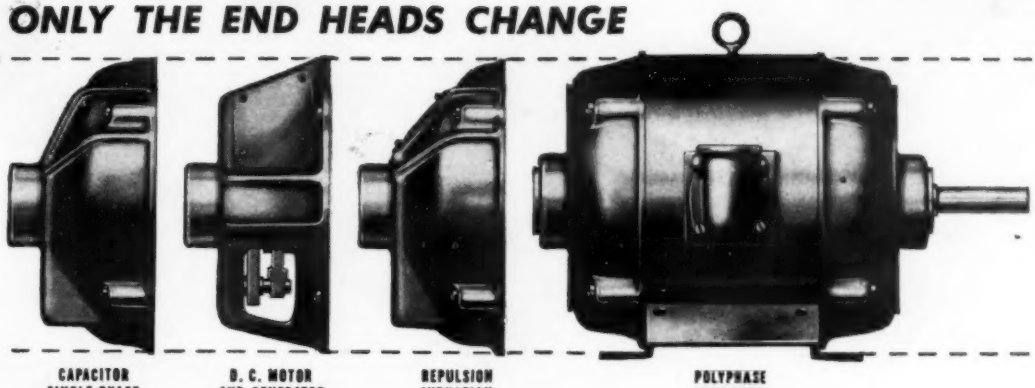
EXPERIENCED SKILL TO SERVE YOU in the unbiased selection of standard bearings or in the design of bearings for unusual applications is offered by Bantam's engineers. Bantam makes every type of anti-friction bearing—straight roller, tapered roller, needle, and ball. No matter how difficult your bearing problem, TURN TO BANTAM.

UNLOOSENING ROCK-BATTERED BOLTS on the caterpillar tracks of tanks and tractors is the tough maintenance job performed by this track wrench, a product of Rodgers Hydraulic Incorporated. Despite the unusually heavy stresses encountered, dependable power transmission is assured by the high load capacity of eight Bantam Quill Bearings and four Bantam Needle Roller Bearings used in the gear mechanism. In addition, these bearings contribute to compact design because of their small size, as can be seen from the accompanying cross-section drawing, and to low power consumption because of efficient lubrication and low friction coefficient.

ARMY NAVY
BANTAM BEARINGS
STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL
THE TORRINGTON COMPANY · BANTAM BEARINGS DIVISION
SOUTH BEND, INDIANA

Here's why you get GREATER INTERCHANGEABILITY IN R&M Uni-Shell MOTORS!

ONLY THE END HEADS CHANGE



CAPACITOR SINGLE-PHASE INDUCTION MOTOR 1-5 H. P.

D. C. MOTOR AND GENERATOR 11-7½ H. P. ¾-5 K. W.

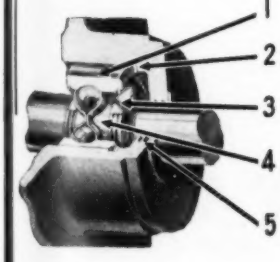
REPULSION INDUCTION MOTOR 1-5 H. P.

POLYPHASE INDUCTION MOTOR 1-30 H. P.

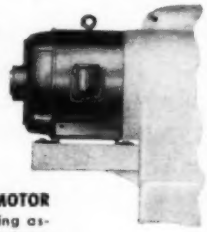
No other motors can give you the complete interchangeability you get in the new R & M Uni-Shell line! All motor types, in any one Uni-Shell frame size, have *identical* shell dimensions, shaft-head fit, bolt circle holes, base, shaft size, and conduit box mountings. Where one type of Uni-Shell Motor can be mounted, so can any! This is a *great* advantage for you, whether you use motors in your products, or just on your production machines.

30 MONTHS IN DEVELOPMENT

Robbins & Myers engineers devoted 30 months of concentrated effort to the development of R & M Uni-Shell Motors, and to testing them thoroughly in hundreds of tough war-production applications. Result: the *finest* line of motors we've produced in nearly 50 years of specialized motor building—greater *interchangeability* than has ever been known before—and many improvements in design and construction that contribute to longer motor life, greater dependability, and higher efficiency. Uni-Shell Motors are built in shells of steel for complete protection. Better bearings and better balancing assure unusually smooth, trouble-free operation. New insulating techniques, combined with the finest materials obtainable, increase motor life. And we have utilized our broad fan-building experience to make ventilation better than ever, keeping interior temperatures *below* guaranteed minimums.



→ **FOR MAKERS OF MOTOR-DRIVEN PRODUCTS,** this shows how the Uni-Shell fits against assembly. Whatever different types you use, no redesigning is necessary. All—in any one frame size—have *identical* shaft-head, shell, and mounting dimensions!



← **BETTER BEARINGS FOR LONGER MOTOR LIFE!** 1. Double-row-width ball bearing assures an adequate supply of lubricant. 2. Spacing washer. 3. Complete seal, both sides—held in by snap rings that are easily removed for inspection, cleaning and re-greasing. The lubricant sealed in—dirt sealed out! 4. Exceptionally large grease reservoir. 5. Annular grooves filled with water-resistant grease to exclude water, dirt, fumes and other foreign matter.

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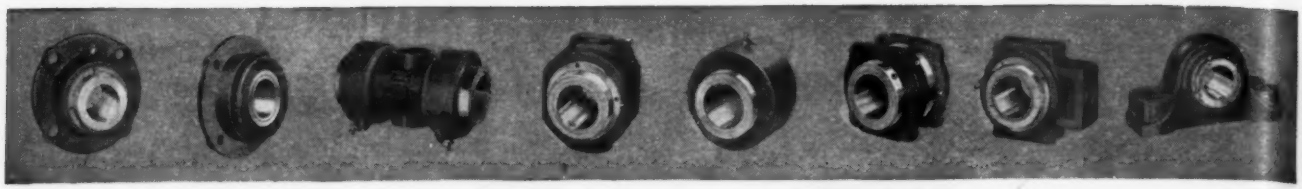
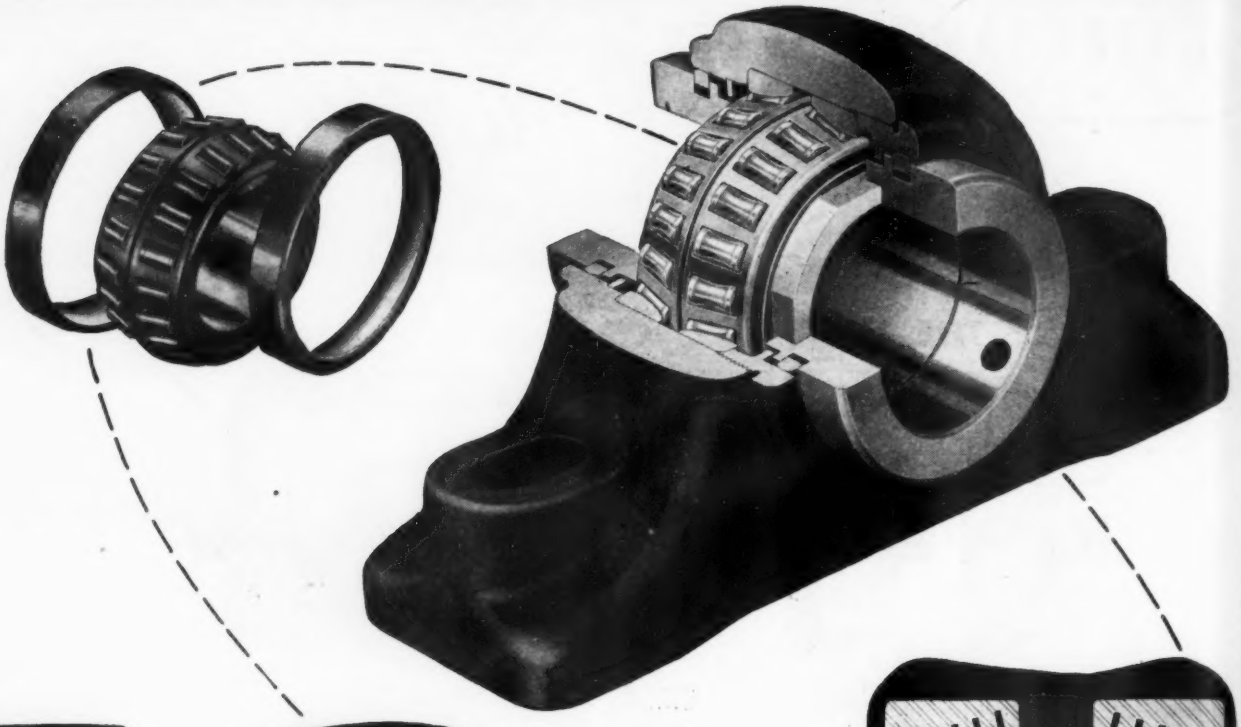
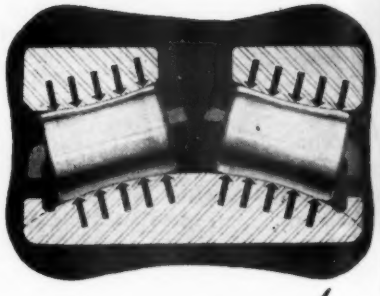




Free Rolling



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BEARINGS
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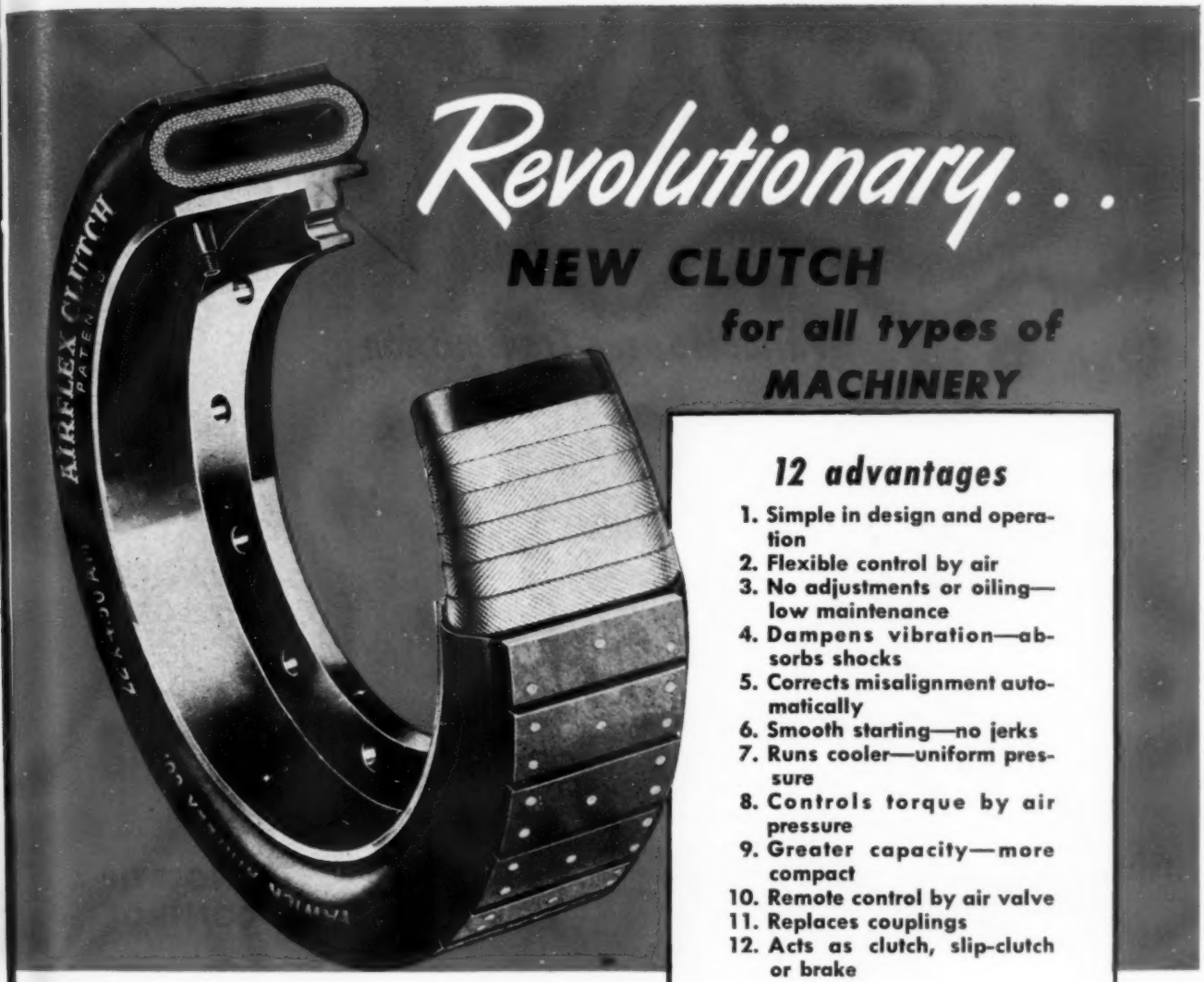

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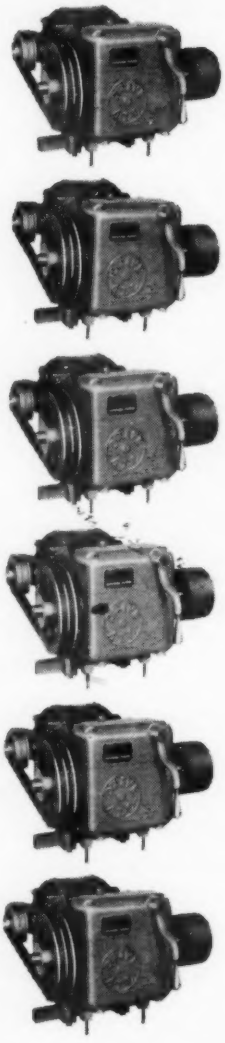

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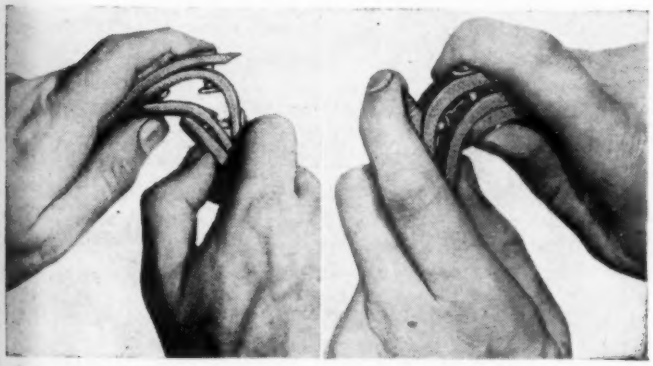
HOW TO COUPLE VEELOS

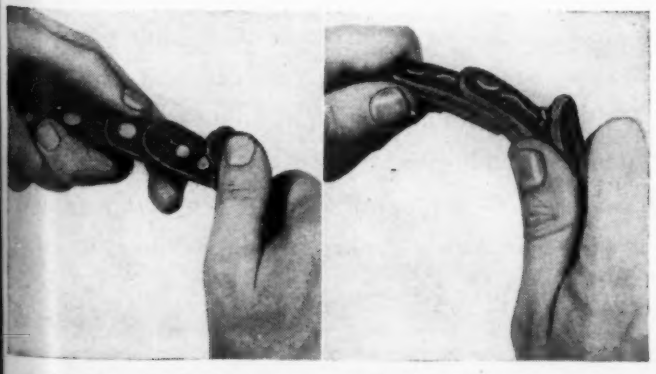
1. *Bring end rivet up through enlarged hole in segment.*

2. *Pass rivet down slot to proper position.*



3. *Bend belt backward holding segment ends together under thumb.*

4. *Bend belt further backward forcing enlarged opening down over rivet head until head is through.*



5. *Straighten belt bringing rivet head up through enlarged hole.*

6. *Bend belt forward to pass rivet down the slot to proper position. Repeat for the other rivets.*

VEELOS—the practical link V-Belt—has been proved on war production drives that really put a belt "through the mill." Veelos is easy to install...easy to adjust...runs smooth ...runs steady. A Veelos engineer ...especially trained in power transmission problems . . . can show you how and why in less than 15 minutes!

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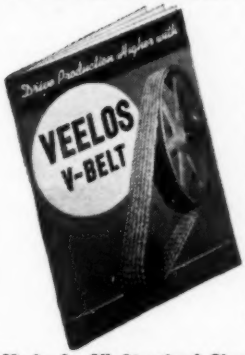

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ADAPTABLE TO ANY DRIVE

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The former, and much more expensive method, was to turn the artificial shoulder —cutting down a larger shaft. Now, by simply grooving a smaller shaft and applying a retaining ring a like result is obtained in a vast number of cases.

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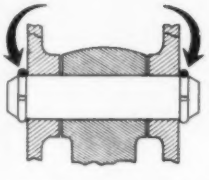

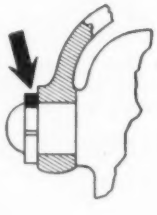

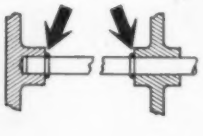

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National retaining rings are made of high grade spring steel which is heat treated after forming, rather than from pre-tempered spring wire. Our standard stock sizes will fill nearly all requirements; special sizes and cross sections made at small extra cost.

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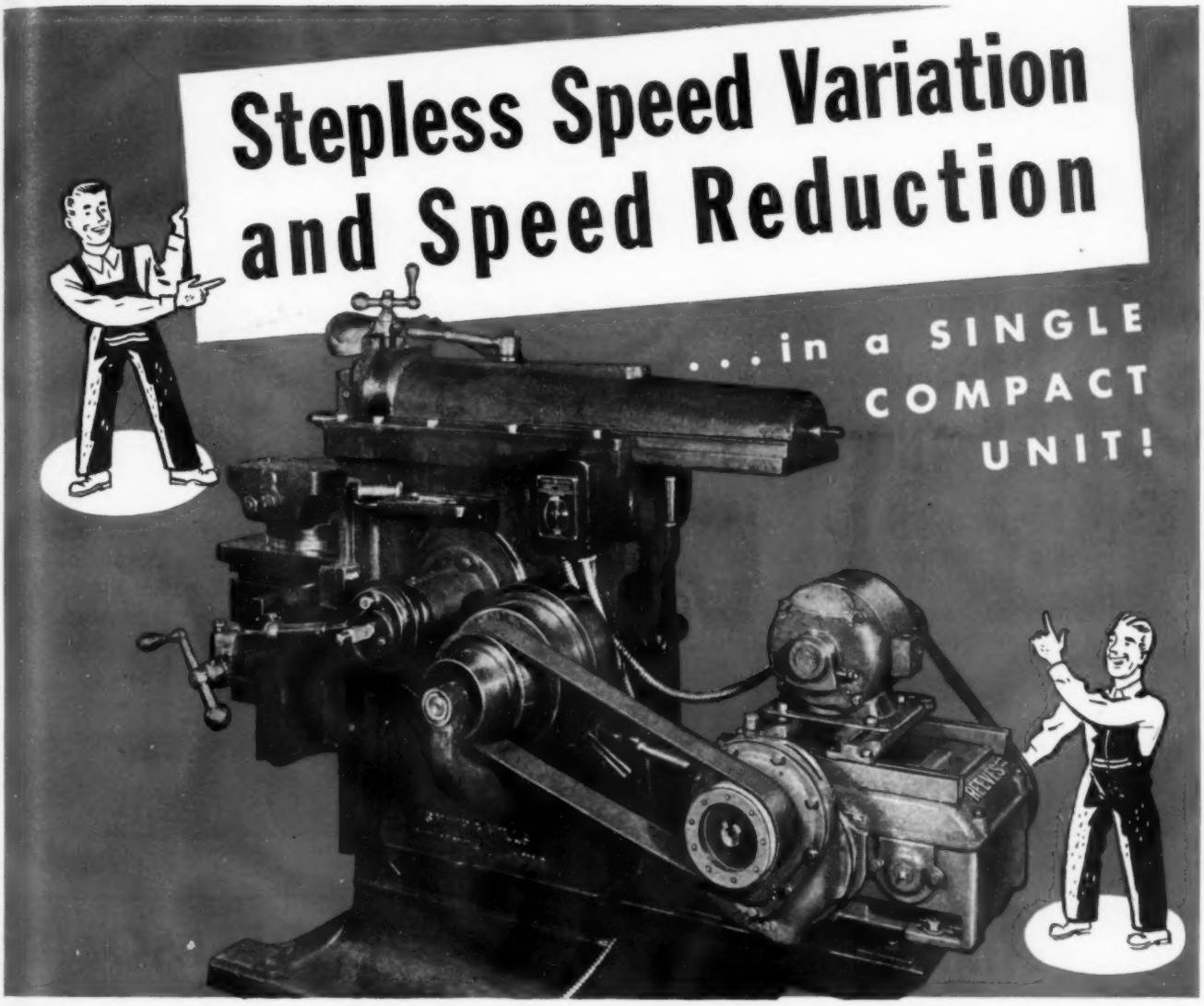

Pictured here is a REEVES Reducer-Type Transmission, horizontal design, with individual motor drive, applied to a shaper.

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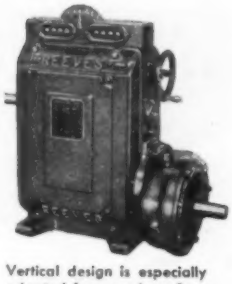

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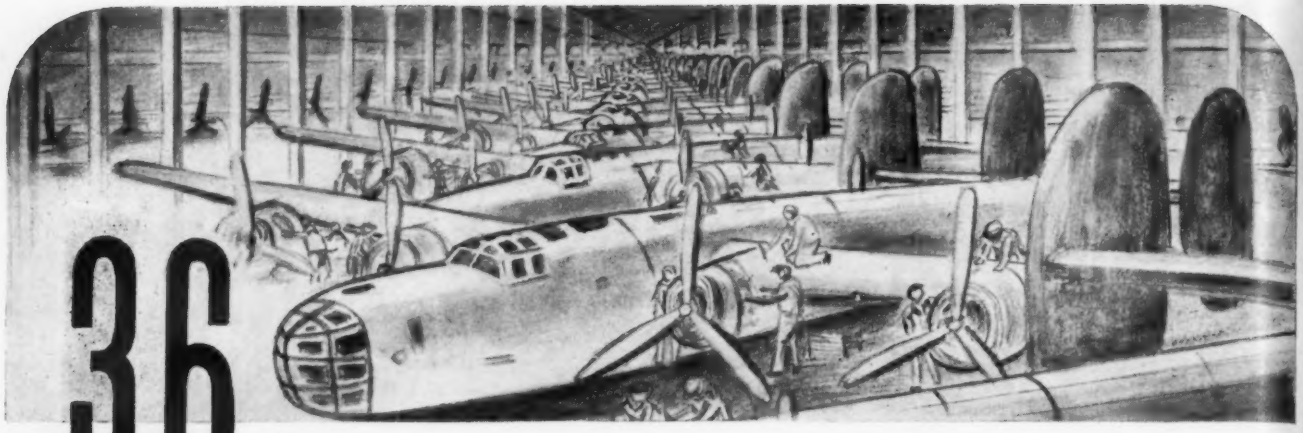

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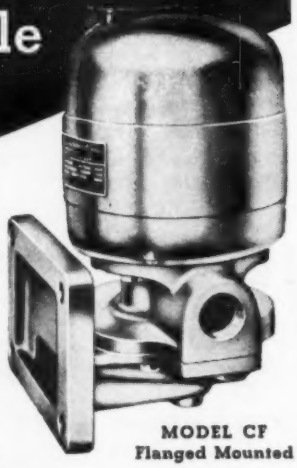

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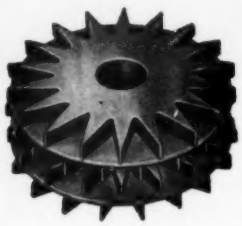

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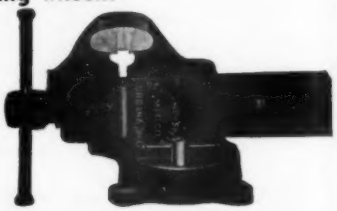

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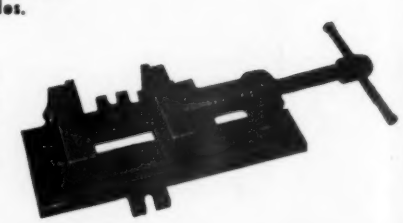

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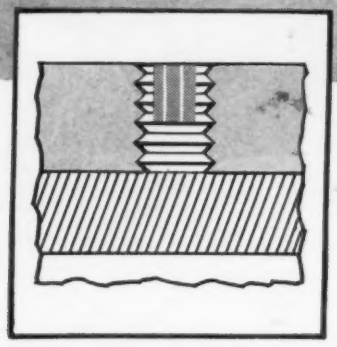

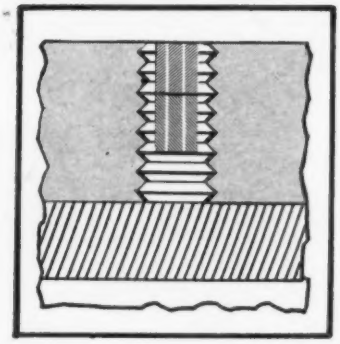

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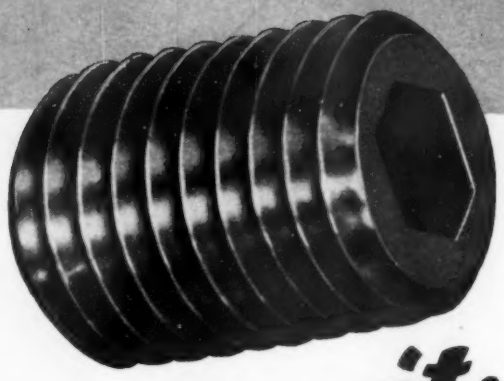

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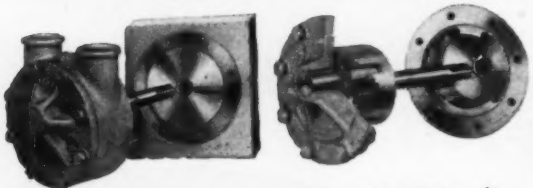

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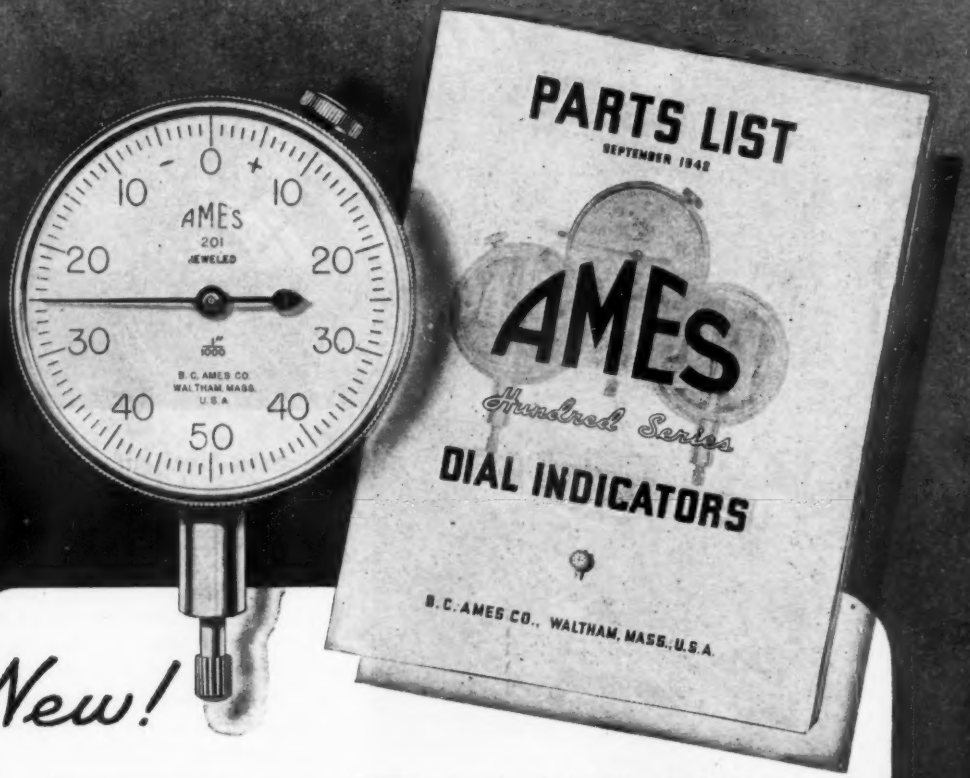

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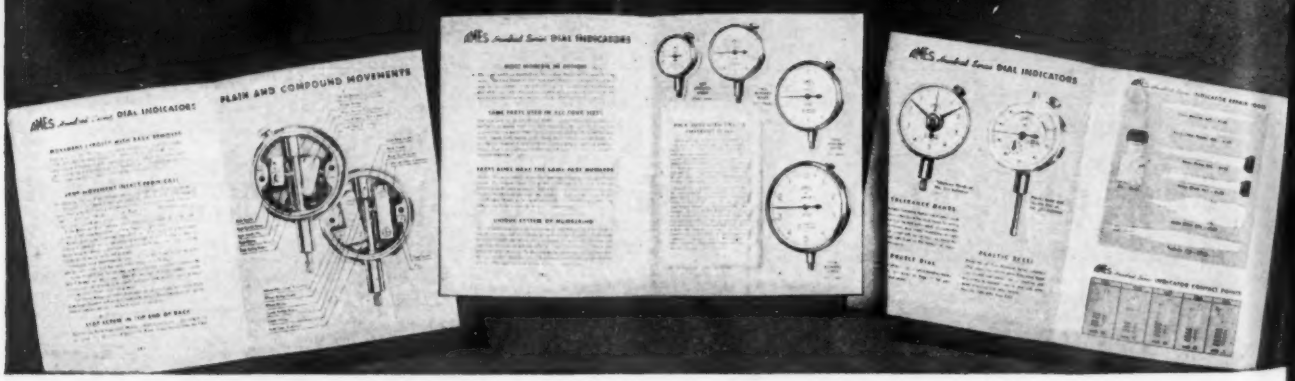

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are just one of the many parts for America's fighting planes where Howard nonferrous castings are effecting weight savings—savings which impart higher speed or greater fire power, heavier bomb loads or more substantial armor.

As the nation's largest jobbing producers of magnesium and nonferrous castings, much has been expected of us in the war effort. We are proud of delivering more than was expected in large tonnages of cast parts of magnesium, aluminum, brass and bronze for America's planes, tanks, tank destroyers, ordnance, ship and armament-making machinery.

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	¾" DIAMETER	⅝" DIAMETER	½" DIAMETER
Actual breaking load	22,400 lbs.	25,600 lbs.	20,000 lbs.
Weight, per 100 bolts	85 lbs.	58.5 lbs.	37 lbs.
Ultimate tensile strength	60,000 psi	100,000 psi	125,000 psi
Material	Hot rolled steel of 0.14-0.22 carbon content	SAE 1035 steel	SAE 4037 steel
Heat treatment	Stress relief	Quench and draw	Quench and draw
Diameter of bolt	¾-inch	⅝-inch	½-inch
Number of threads per inch	16	18	20
Mean diameter	0.6891 in.	0.5708 in.	0.4512 in.
Area at mean diameter	0.37297	0.25596	0.15994
Length under head	6 inches	6 inches	6 inches

Above data shows essentials of some of the timeliest advice given by Lamson engineers. It shows how and why a smaller bolt using 57% less steel will carry the same load in tension as the larger bolt!

of using a bolt — ONLY YOU THOUGHT YOU NEEDED!

Here are photographed three bolts, actual size, of standard type and dimensions, made by most bolt manufacturers as well as by Lamson & Sessions. These three sizes were selected merely because they are typical of the most commonly used sizes, and sizes both larger and smaller than shown, *of the same materials, made the same way, properly heat treated,* will develop proportionately the *same characteristics* and advantages we are discussing specifically for the three bolts shown. One of these bolts is ¼" x 6"; another is ⅜" x 6", and the smallest is ½" x 6". Let us look at the ¼" x 6" bolt and study a comparison of it with the two other bolts illustrated.

The table of values at left is extremely significant to designers who lay out bolted assemblies. It definitely shows how you can use a bolt *approximately half the size of another* and yet obtain all the essential values you need. And that means that the designer can provide all the strength he needs *and reduce weight*—and in building a bomber or a tank or a ship, saving weight is a prime objective, wherever you can, *without sacrificing strength.*

Now what does this substitution of a smaller bolt mean besides a tangible saving in weight of the finished assembly?

It means—and this is vitally significant to you and all of us—*that only one-half as much material is needed to make the smaller bolt* as is needed for the larger bolt. Which in turn means that we need to draw less upon supplies of critical materials, that we need a smaller inventory of materials, and finally that we can ship more units of finished bolts per car-load of the smaller bolt than we can of the larger bolt.

These are such obvious facts that you might wonder why we call them to your attention, but we so frequently run into a situation where a manufacturer is using a larger bolt than is necessary that we feel that the "know how" of the Lamson bolt engineer is too little used. Naturally, our engineers know the bolt business. And quite naturally, your own engineers can hardly be expected to be bolt specialists as well as experts in their own specific job. So do not hesitate to ask Lamson engineers in to examine your shop practice—for from their vast experience you may be able to get some ideas and practical help that will save time, money and effort for you—*and speed up your war materials production.*

It is also possible for Lamson engineers' "know how" to save time *right now when time means so much*—by being able to show you how to use a part that we can make by hot or cold forging that you are now buying made by slower methods. Saving time is usually accompanied by a saving of *raw material*—of vital importance under the new Controlled Materials Plan.

Yes indeed, Lamson men can help you with your war production, if only you will call them in to do just that.

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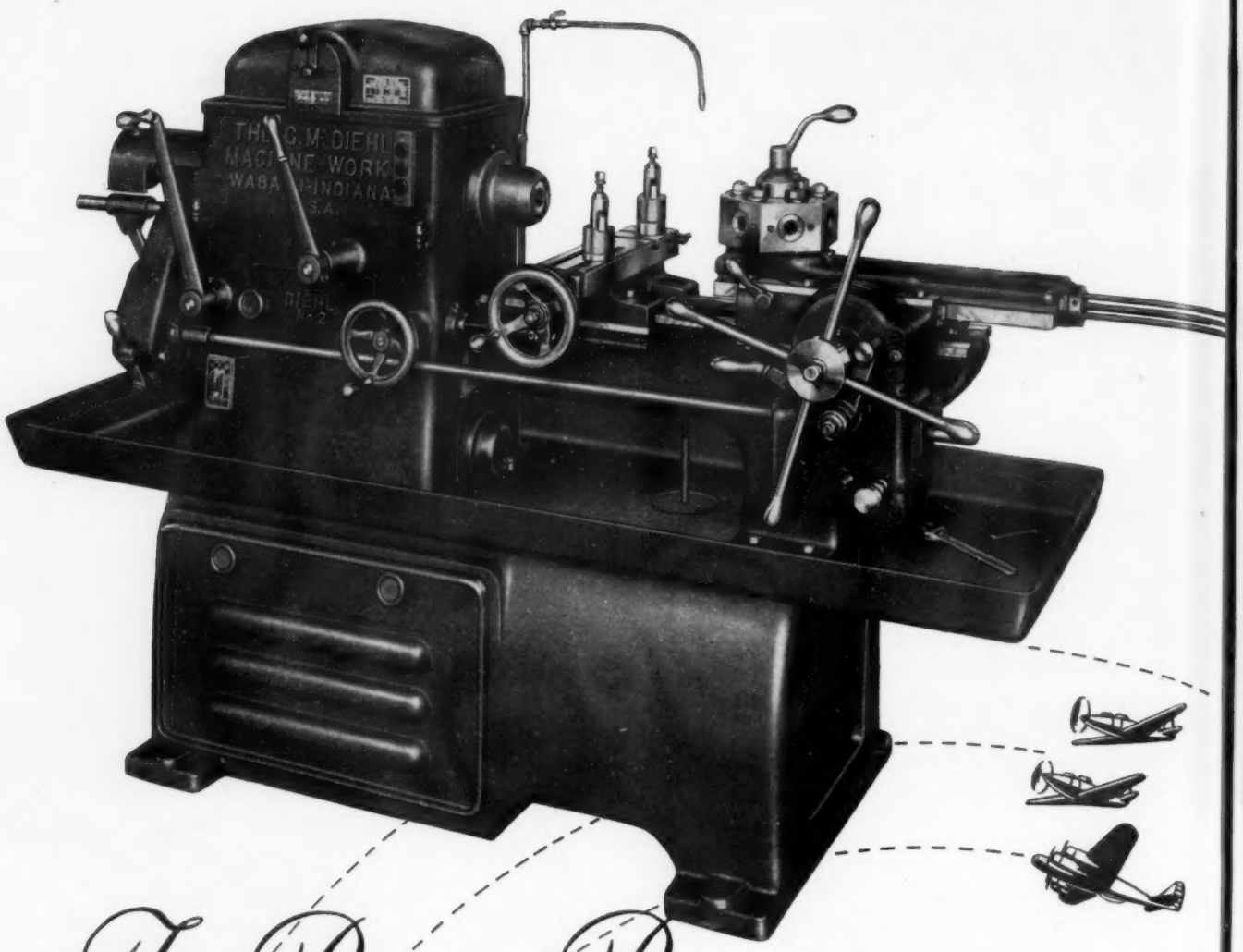

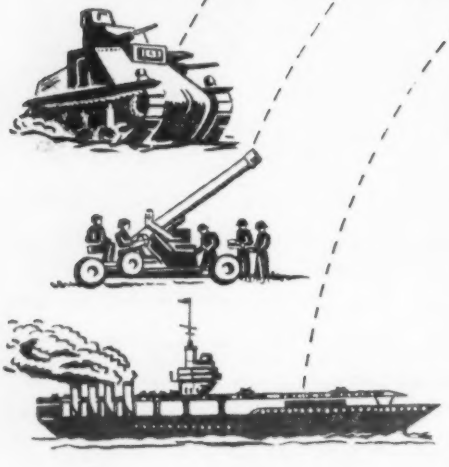

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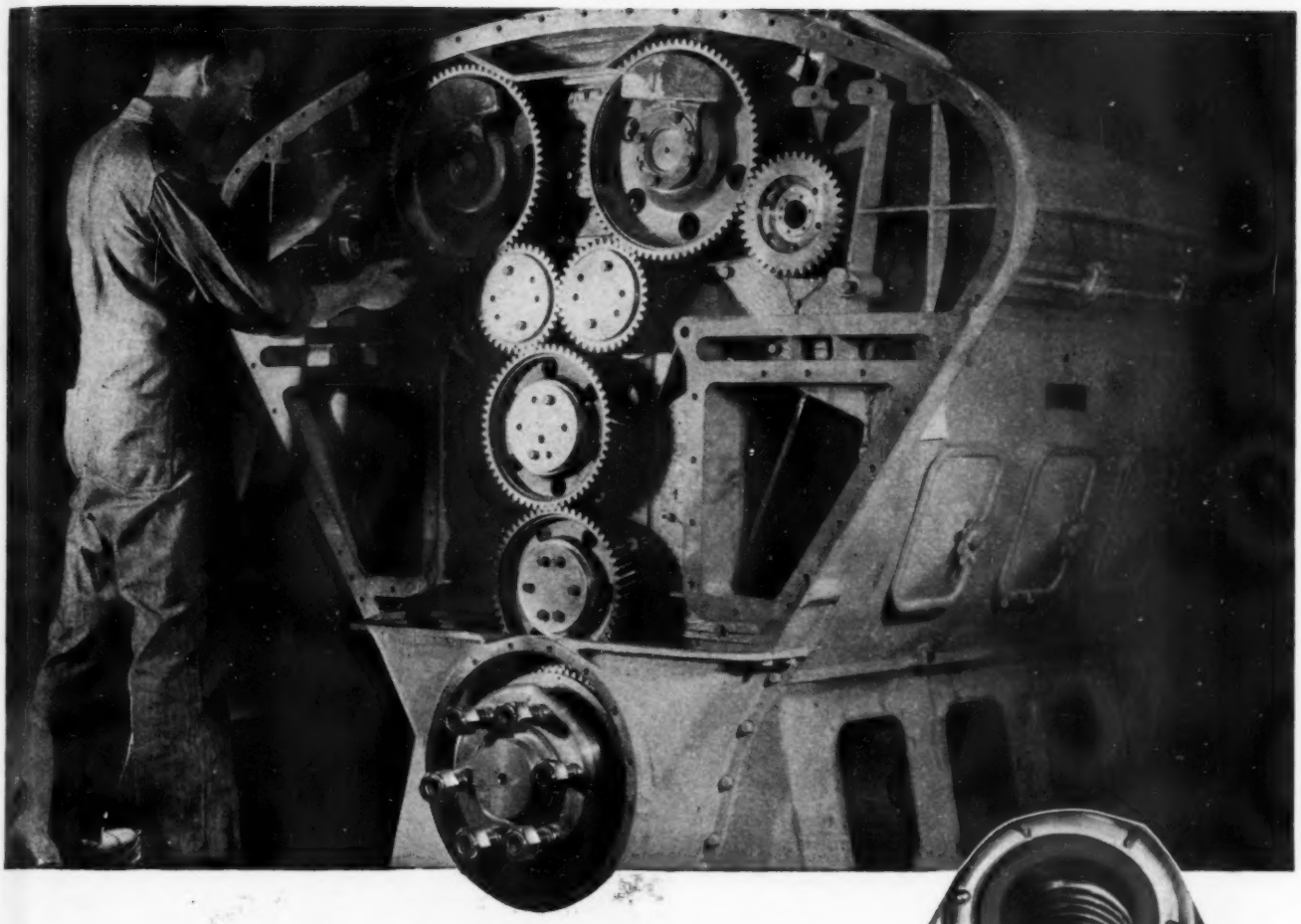
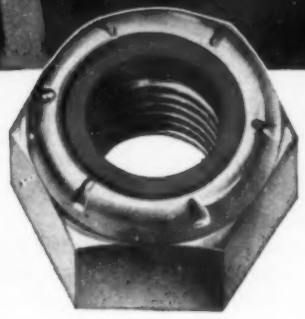




SIX NUTS THAT BRIDLE A THOUSAND HORSEPOWER

THIS is the business end of a powerful Diesel engine.

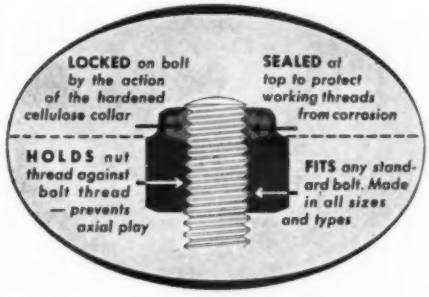
Well over a thousand horsepower spins through that coupling — through those six studs.

To connect that coupling, old-style lock fastenings wouldn't do. They couldn't both lock and be tightened to spread the load evenly. So studs failed.

The solution shows in the photo – Elastic Stop Nuts.

With these fastenings, uniform pressure was obtained as well as complete security against nuts working loose.

In the peacetime production to come, equally puzzling problems will plague manufacturers.


LOCKED on bolt by the action of the hardened cellulose collar
SEALED at top to protect working threads from corrosion
HOLDS nut thread against bolt thread — prevents axial play
FITS any standard bolt. Made in all sizes and types

And we are prepared to help. Our engineers who today are solving war production problems will be ready to share their wide experience with you.

Whenever you have a fastening job let us know. Our men will work with you on it and recommend the correct Elastic Stop Nut to produce a better product or to facilitate its manufacture.

ELASTIC STOP NUTS

Lock fast to make things last

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Machine tools like the Robot Surface Grinders are important "weapons", not only on the production front, but on fighting fronts throughout the world. Repairing and rebuilding mechanized equipment requires shaping and sizing innumerable metal parts to accurate dimensions. For this vital job, performed under the worst possible conditions, only machines of lasting, dependable precision are suitable.

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Assembling the Robot Surface Grinder requires over 100 Socket Screws – about 60 to hold gears. The Robaczynski Machine Corp. of America, Brooklyn, N. Y., manufacturers of this equipment, get insurance against trouble by specifying "Parker-Kalon".

PARKER-KALON
Quality-Controlled
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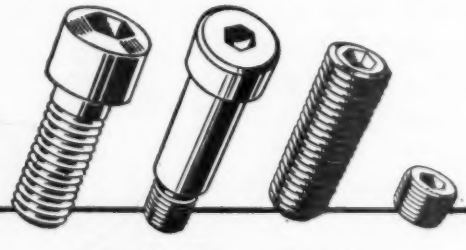
Give the Green Light to War Assemblies



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Complete test and inspection covering: Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, Height and Concentricity; Socket shape, size, depth, and centricality; and Thread fit.

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LUBRICATING SYSTEMS

They Relieve "Oilers" and "Greasers" for other work . . . provide better, more dependable, less costly lubrication

● Avoid the costly down-time while an oiler crawls over a machine lubricating each bearing individually,—the breakdown if he misses one,—the costs and lost time of accidents. You can assign these men to other, more important, and safer work by equipping your machines with Trabon Lubricating Systems!

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Trabon lubrication makes absolutely certain that every connected bearing whether large or small, easy or difficult to reach, receives the exactly desired amount of lubricant. It minimizes down-time and machine tie-ups—prolongs bearing life—reduces accidents and compensation costs. Install Trabon on your machines and get the many design and operating advantages only Trabon can give you. Manual or automatic operation. Send today for new fully descriptive Engineering Bulletins!

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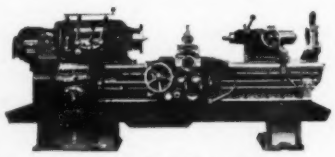

Axelson Heavy-Duty Engine Lathes are available in six sizes and various lengths. Their many features include a 24-speed headstock, 2-speed tailstock spindle, unit mounted constant speed motor and automatic lubrication. Before you buy any lathe, investigate Axelson.

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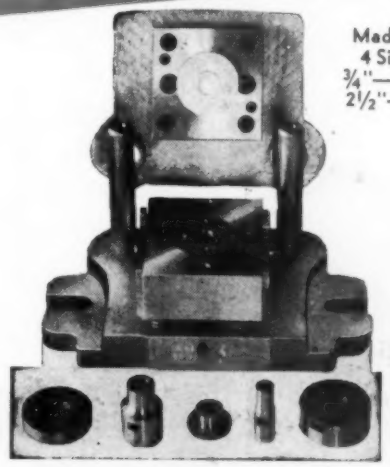

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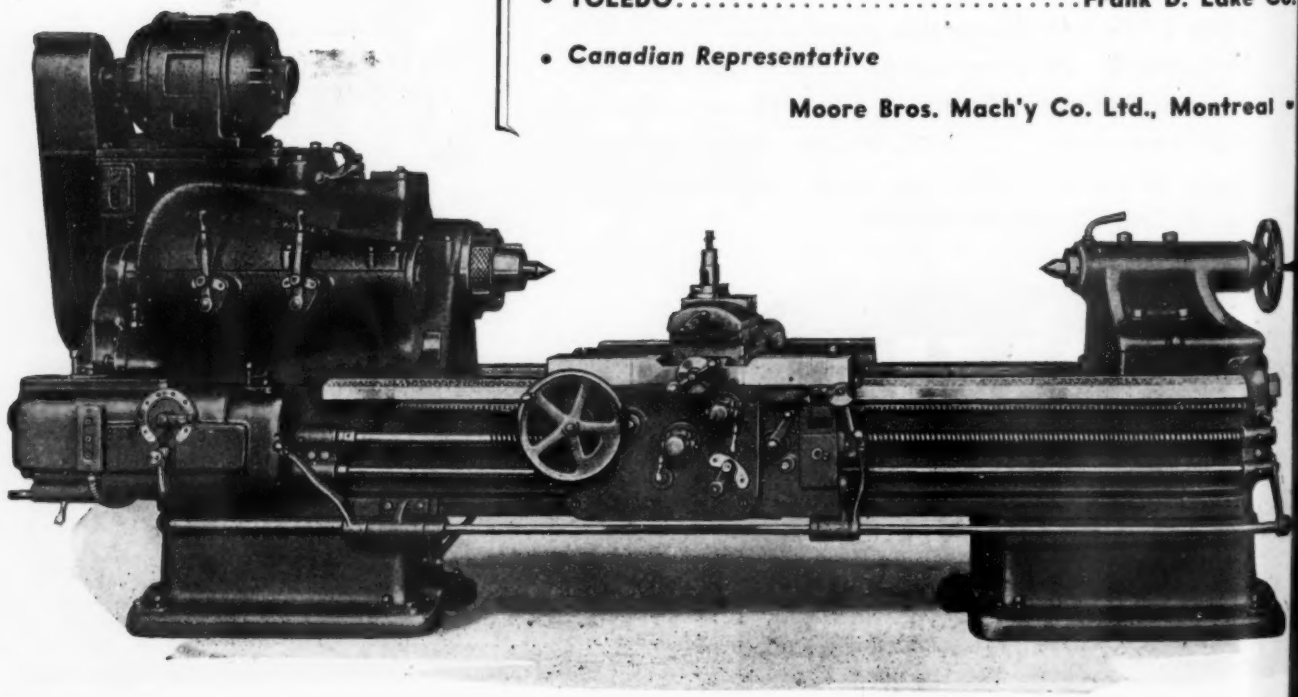

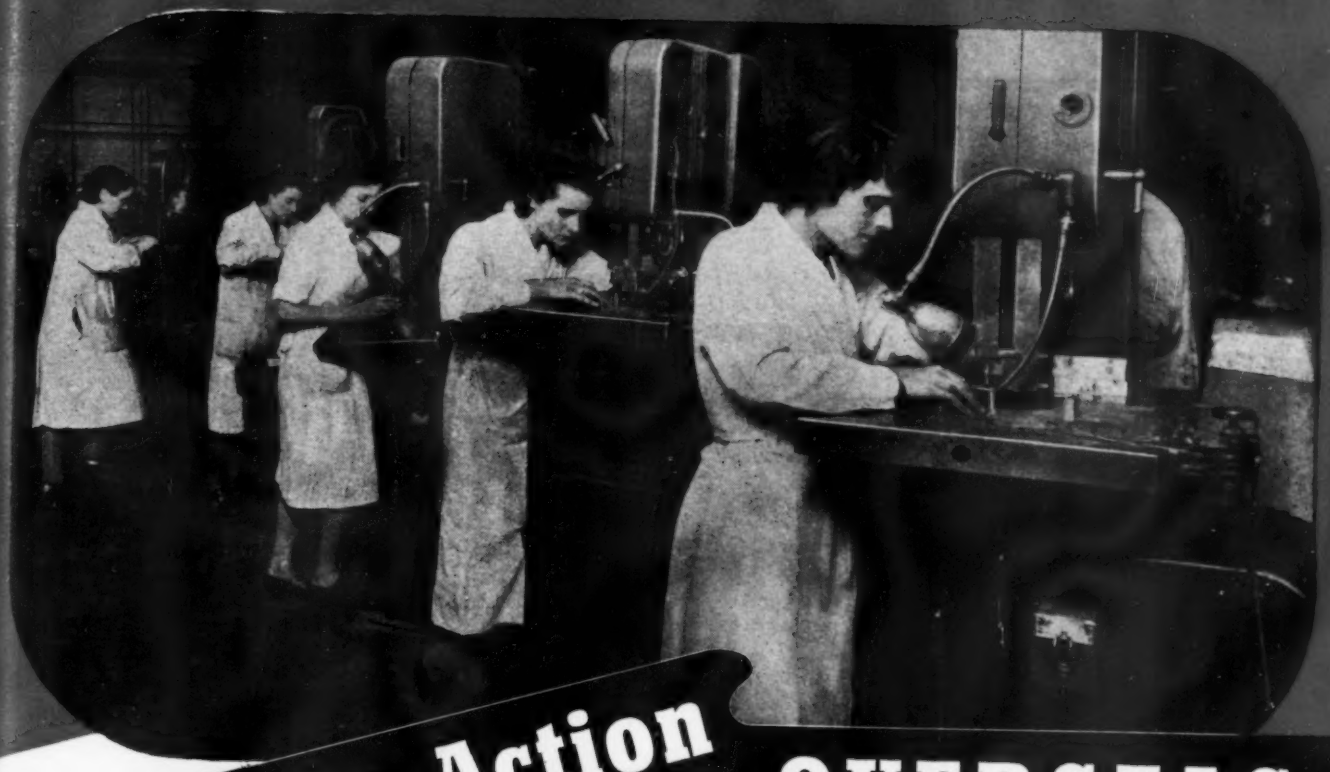

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2nd January, 1943

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Minneapolis, Minn.

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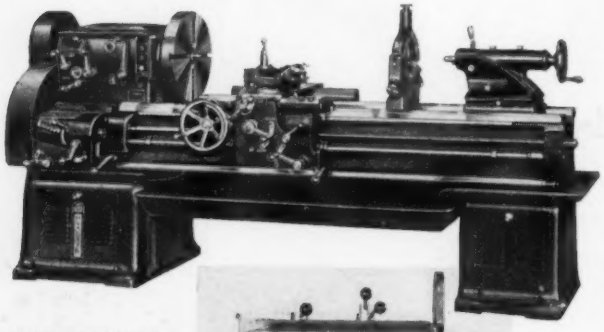
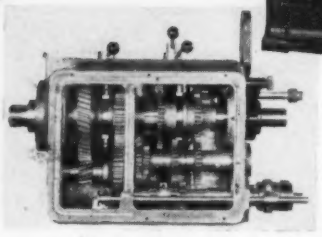
OFFERS *the* Metalmaster





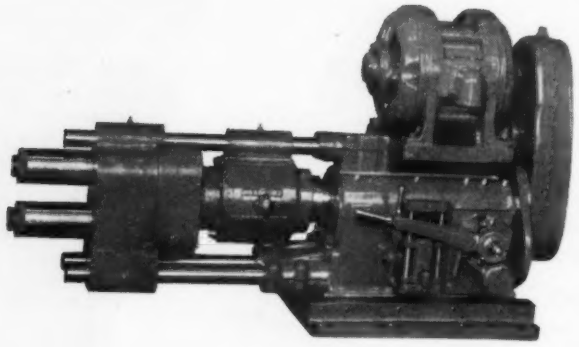
THE METALMASTER SIZES — 12", 14" and 16" swing — 6' to 16' bed. At right is the geared head assembly with cover removed.

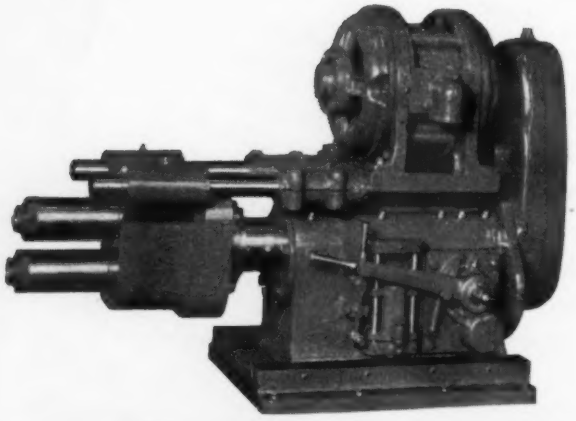
—from headstock to tailstock, a product of highly skilled engineering.

HEADSTOCK — Advanced design, heavy walls plus sturdy center bracing, twelve spindle speeds, both forward and reverse, simplified control system—all these features combine to assure highest efficiency—satisfaction under the most rigorous conditions.

DRIVE—Smooth, quiet power is a first consideration in the construction of the METALMASTER. Power is delivered to the speed-change gears through a multiple disc clutch. Convenient handles operate the clutch—jogging with the motor running at high speed is possible with these same handles.

. . . *and* BRADFORD UNIT-TYPE SELF-CONTAINED SINGLE OR MULTIPLE SPINDLE HEADS





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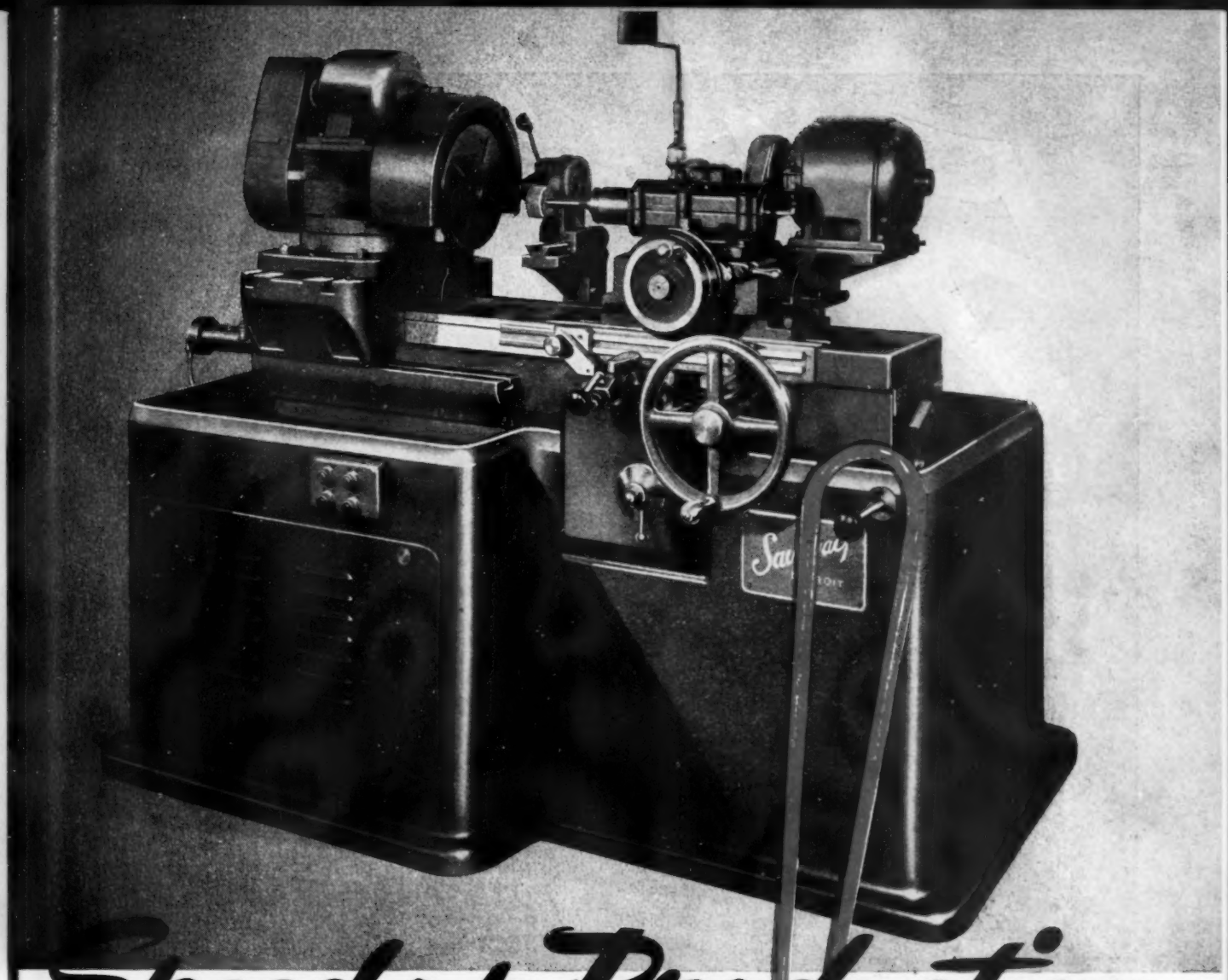

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WITH THIS NEW Sav-way MODEL M-H-2 INTERNAL GRINDER

OFFERS both hand and hydraulic table operation . . . each independent of the other . . . a new and exclusive Sav-way feature . . . permits use of both hand and hydraulic feed in combination on the same job in the same setting . . . other special features that help speed up production . . . send for literature giving details and complete specifications.

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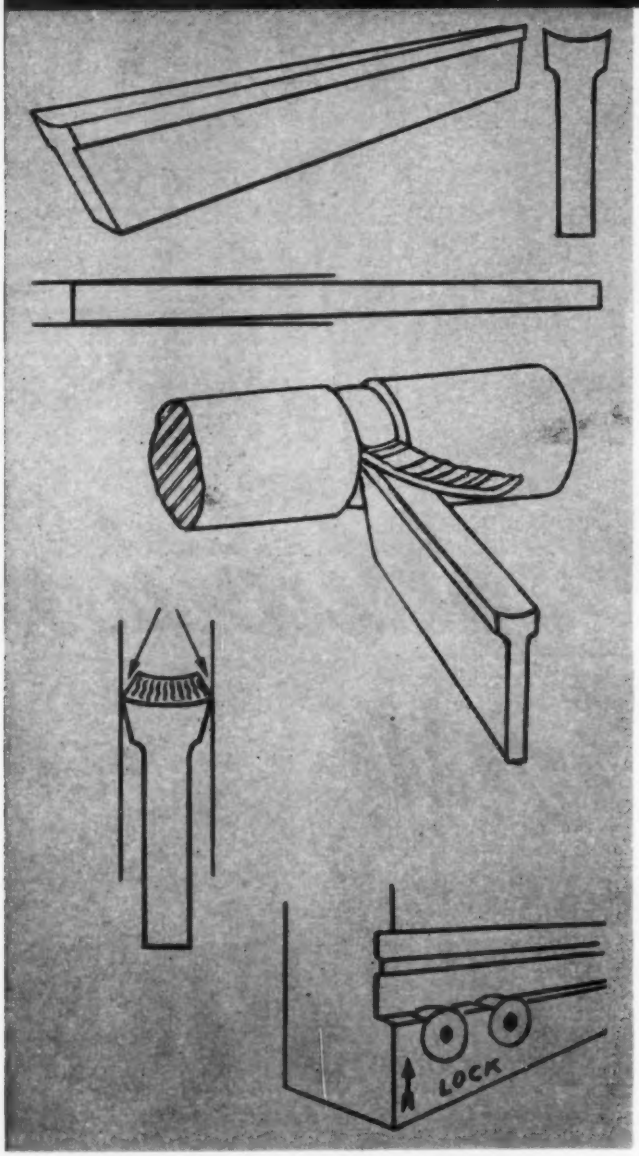
4873 EAST EIGHT MILE • DETROIT, MICHIGAN

5 Good REASONS

for using EMPIRE TOOL COMPANY'S LUERS PATENTED CUTTING-OFF BLADES in your cutting-off operations

TO CONVERT DOWNTIME INTO PRODUCTIVE TIME



Blades, both tapered and parallel on the longitudinal cutting width, carried in stock.

READY FOR IMMEDIATE SHIPMENT

✔ BEING T-SHAPED, the blades provide ample side clearance. Excessive friction is eliminated and breakdowns are materially reduced.

✔ TAPERED BLADES retain a constant back clearance. Front face is only part that requires resharpening. Practically the entire length can be employed to usable purpose.

✔ CURVED TOP causes chip to collapse, which reduces friction against sidewalls of cut. Your production is increased because less frequent regrinds are made.

✔ COOLANT can reach actual cutting edge of blade where greatest heat usually generates. This feature obviously lessens friction and lengthens blade life.

✔ HOLDERS have two developed cams which hold blades with bulldog grip, yet permit instant release for resharpening, and simple, quick replacement without disturbing setup. Enable blades to be used until they are reduced to within an inch of their original length.

• • •

SEND FOR NEW CATALOG

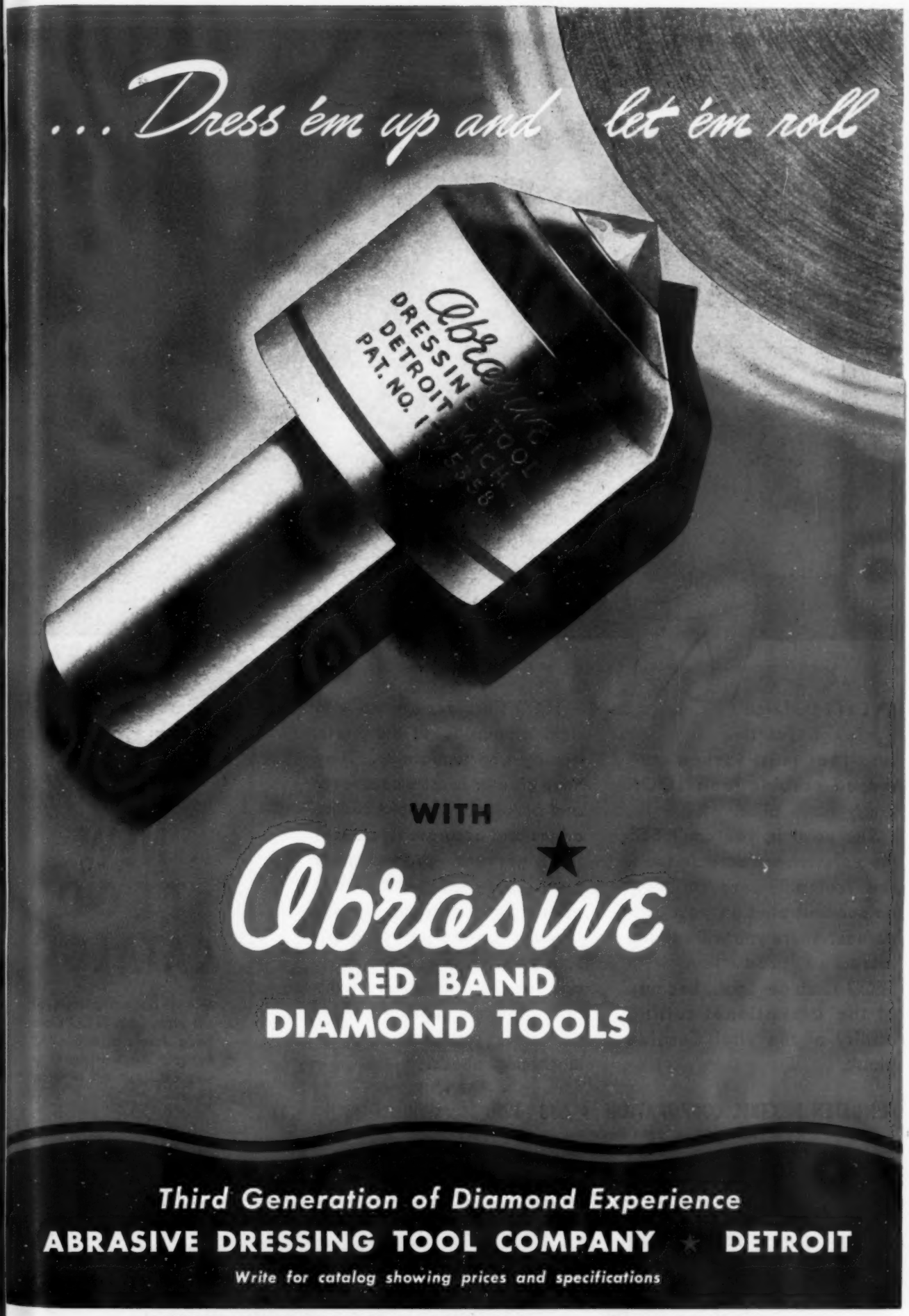
Empire Tool Company manufactures Luers Patented Cutting-Off Blades and Holders under license issued by John Milton Luers Patents, Inc.

BUY WAR BONDS

The Blades that reduce friction

EMPIRE Tool Co.

8778 Grinnell Ave. Detroit, Mich.


... Dress 'em up and let 'em roll
WITH
Abrasive
RED BAND
DIAMOND TOOLS
Third Generation of Diamond Experience
ABRASIVE DRESSING TOOL COMPANY ★ DETROIT
Write for catalog showing prices and specifications
A FEW TERRITORIES STILL OPEN FOR DISTRIBUTORS • WRITE FOR DETAILS

Notice anything different about these CARBIDE TOOLS?

DON'T study too long! You'll find that most "standard" shaped carbide tools LOOK pretty much alike.

The point is, you can't SEE the difference in carbide tools. The real difference can only be demonstrated *on your machines!* There you will see the increased production with TECO Carbide Tools, because of the exceptional cutting ability of the vital Carbide blank.

TECO Carbides are made to rigid standards of hardness, density and uniformity. They have greater resistance to wear and breakage . . . hold cutting edges and accurate tolerances for longer runs — produce more pieces between grinds — save grinding and re-tooling time.

Make on-the-job comparisons with TECO Carbide Tools and see the difference! Available promptly in grades, styles and sizes for practically all machining needs.

Write for your copy!

NEW TECO CATALOG

Gives specifications of all standard TECO Carbide Tools and Blanks for turning, boring, facing and cut-off operations.

TUNGSTEN ELECTRIC CORPORATION • 568 39th St., Union City, N. J.

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio

Representative: Architects and Builders Bldg., Indianapolis, Ind.

TECO CARBIDE TOOLS

Pioneers in Tungsten Carbides for over a Quarter Century

WHAT'S IN A NAME?

UNBRAKO

REG. U. S. PAT. OFF.

SELF-LOCKING HOLLOW SET SCREWS • KNURLED SOCKET HEAD CAP SCREWS

RESULTS OF TEST:

189,200

POUNDS PER SQUARE INCH

Ultimate Tensile Strength

. . STRENGTH

is only one of their advantages

Write for the "Unbrako" Screw Catalog

The KNURLING of Socket Screws originated with "Unbrako" years ago.

"Unbrako" Screws are forged from such high quality alloy steel that, as their name suggests, they are practically unbreakable under normal circumstances. Their great strength (189,200 lbs. per square inch after heat treatment) often permits the use of smaller or fewer screws, making possible more compact design and quicker assembly.

KNURLED HEADS on "Unbrako" Socket Head Cap Screws provide a non-slip grip that enables greasy fingers to turn screws down faster and farther by hand. Yet you pay no premium for this time and labor saving feature when you order "Unbrako."

KNURLED POINTS on "Unbrako" Hollow Set Screws are an exclusive feature, designed to make set screws "stay put." When tightened as usual, the knurls dig in . . . prevent screw from vibrating loose . . . yet screw can be easily removed with a wrench and used again and again.

ACCURACY—"Unbrako" Screws are precision made. General dimensions, as well as threads, are held to very close tolerances.

DELIVERIES of "Unbrako" Screws are still, we believe, better than average.

SIZES—from No. 4 to 1½" diameter. Also other types of screws.

STANDARD PRESSED STEEL CO.

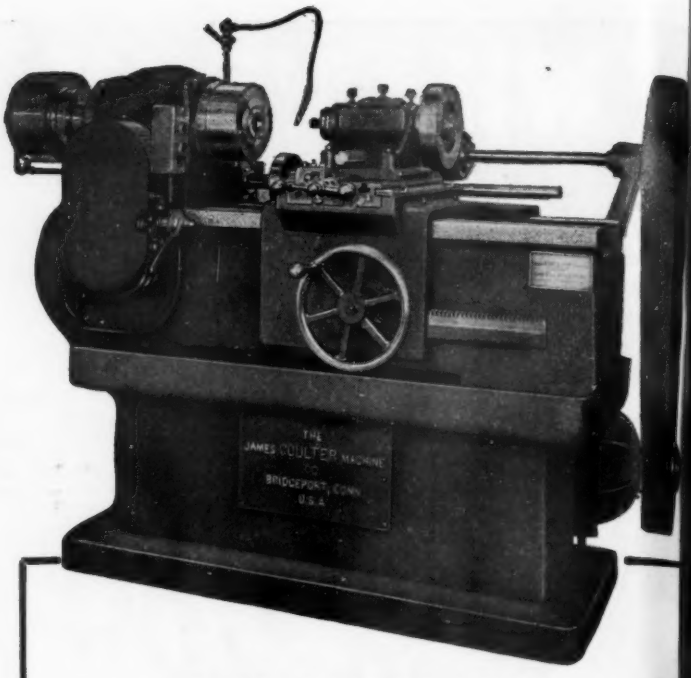
JENKINTOWN, PENNA., BOX 4 • BRANCHES: BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

Precision LATHE PANS

If your Lathe or another piece of equipment needs a pan, Littleford can fabricate it to specifications. Any size or shape can be made in our modern plant. Send blueprints for prices.

LITTLEFORD

LITTLEFORD BROS., INC.
434 E. Pearl St., Cincinnati, Ohio

For Employee Training

"THE TOOLS OF OUR TRADE" . . . *American Machinist's* 16-page special section on elementary shop practice now available in reprint form.

AMERICAN MACHINIST—330 W. 42 St., New York, N. Y.
Please send me.....copies of "The Tools of Our Trade"

Name.....

Title.....

Firm.....

Address.....

Production executives will find in this exactly the type of information needed by new workers. Removes the chief obstacle to the novice's progress—the simple fact that he doesn't know the names of things. Covers measuring, gaging, marking, holding, cutting, forming and milling tools. Basic instruction data which will save you months of preparation time.

10c each—MAIL COUPON TODAY

Here's a machine that helps to relieve

MANPOWER SHORTAGE

SIMPLIFIED DESIGN of this modern, motor driven lathe eliminates many costly features not required for a wide variety of turret lathe work.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Now Equipped with Automatic Indexing Turret

Concentrate highly skilled operators on complicated machines to handle only such jobs as demand top skill. Divert a wide variety of simpler operations to the Oster No. 601 "RAPIDUCTION" Turret Lathe which does the work equally well but with less experienced operators.

That formula, simple as it sounds, has proved to be an effective solution to the growing problem of "MAN POWER SHORTAGE" of highly skilled workers who can't be "duplicated" with novices crammed with a few weeks training.

But the same "novices" CAN be brought quickly to high standards of efficiency with the Oster No. 601 "RAPIDUCTION" Lathe. This modern, motor driven machine with its six-position turret now controlled by automatic indexing is doing multiple-shift work in scores of war production plants.

We're celebrating our 50th Anniversary by helping war production plants minimize the problem of MANPOWER SHORTAGE.

The form below is a convenient way of inviting us to "celebrate" in YOUR plant.

No Time Out to Celebrate Our 50th ANNIVERSARY 1893-1943

OSTER

THE OSTER MFG. CO., 2049 E. 61st ST., CLEVELAND, OHIO, U. S. A.

★ O. K. Oster. We're interested in the No. 601 machine. ( ) Send Catalog No. 601. ( ) Ask your nearest distributor to see us at once. (Check either or both of above requests.)

NAME .....

ADDRESS .....

CITY ..... STATE .....

Rugged . . . Accurate Versatile . . . and Fast!

With these four qualities combined in perfect proportion, Cincinnati Lathes are capable of high production to the exacting standards required in aircraft, munitions, and other war work. Send us details of your war production jobs and let us help you tool up for maximum output using Cincinnati Lathes in 14" to 30" sizes. Write for latest catalog.

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley — Cincinnati, Ohio

SPECIALISTS SINCE 1906

STEVENS SCREW MACHINES

⅝ in. and 1⅛ in. Bar Capacities.
Simplified and Highly Efficient Motor Drive.
Write for bulletin.

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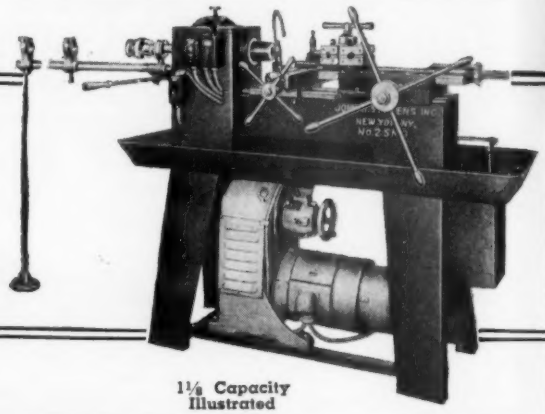
Also makers of Multiple Spindle Index Centers, Rotary Tables, Milling Machine Vises.
THIRTY YEARS' EXPERIENCE

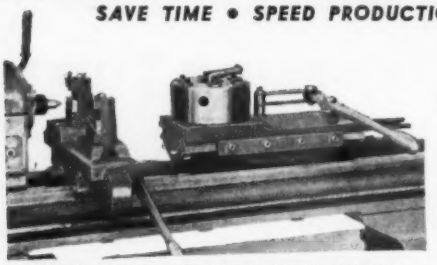


1⅛ Capacity Illustrated

JOHN B. STEVENS INC.
474 Canal St., New York, N. Y.

HEAVY DUTY Self-Indexing BED TURRETS

SAVE TIME • SPEED PRODUCTION • CUT COSTS



HANDLES SCREW-MACHINE WORK
Ask Your Jobber or Write for Circular

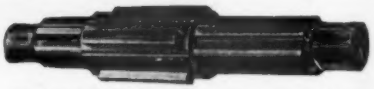
Complete unit with cutoff cross slide and tool posts designed for Logan, South Bend, Atlas and similar types of bench lathes. This unit is equipped with a heavy 6 inch turret head and built to bore out to 1 inch, permitting the use of solid sockets with Morse tapered hole, accommodating No. 1 and No. 2 taper, which is not possible with the ordinary 5 inch head.

LYNN MANUFACTURING CO., 219 Elroy Street, Minneapolis, Minn.

Don't Overlook This Possibility for Increased Production

★ ★ ★

Equip your shop with these economy tools for holding work while being machined. Hardened tool steel—precision ground.



NICHOLSON *Expanding* MANDRELS

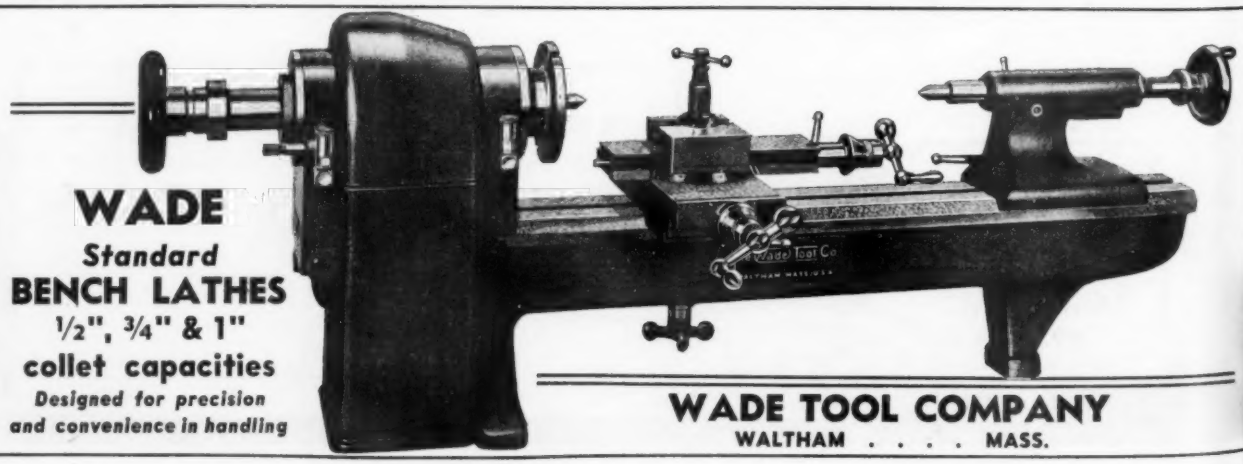
Save Time
Improve Shop Efficiency

Two types. All sizes. Sold singly or in sets. Prompt delivery. Bulletin No. 741.

W. H. NICHOLSON & CO.

114 OREGON ST., WILKES-BARRE, PA.

Other Products: Arbor Presses—Control Valves—Steam Traps—Etc.



WADE

Standard
BENCH LATHES
½", ¾" & 1"
collet capacities
Designed for precision and convenience in handling

WADE TOOL COMPANY
WALTHAM . . . . MASS.

A Check-off of Your Requirements for FORM RELIEVED MILLING CUTTERS

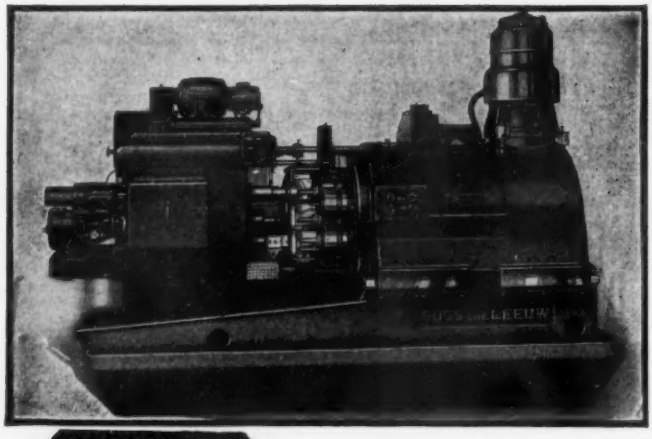
It is only reasonable that, when you place orders for form relieved milling cutters, you should expect:

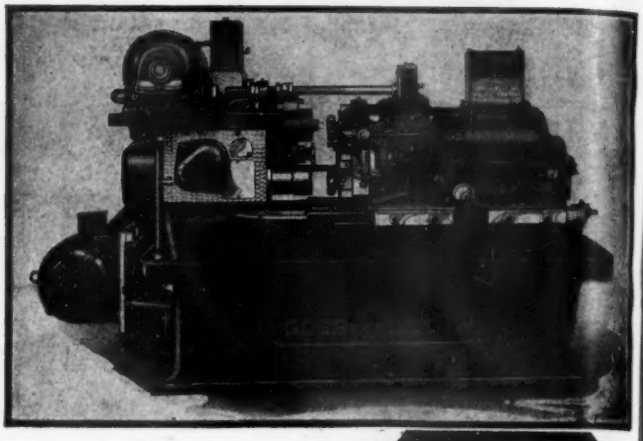
- ✓ Strict adherence to the tool design, dimensions and tolerances which appear on your prints.
- ✓ The use of high speed steels that will guarantee tools of long life and lasting accuracy.
- ✓ Reasonably prompt delivery.
- ✓ Intelligent cooperation of a manufacturer who is thoroughly experienced in producing cutters of this type and who, when it seems advisable, can offer suggestions and recommendations to improve the performance of the tools for your particular jobs.

Morse Tool Company has manufactured thousands of types of form relieved milling cutters over the past 22 years. With the experience, ability and facilities available today, it is one concern you can certainly depend on to complete to the last detail the "check-off" of your list of requirements.

Morse Tool Company 116 E. GOLDENGATE ST. DETROIT • MICHIGAN

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

Lead Screw Threading on both types—Pre-loaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

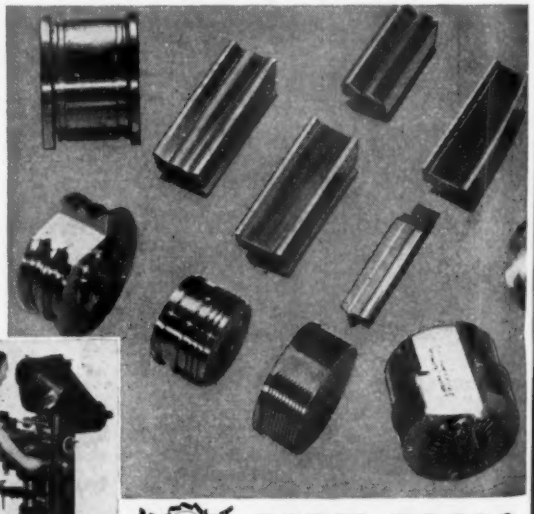
GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

Here's the Size for the Big Jobs

12" x 36"
RECTANGULAR MODEL
PERMANENT
MAGNET TYPE CHUCK
Helps boost production rate of large pieces—or large quantities of duplicate parts.
No wires — no heating — no operating costs.
Catalog showing full line on request. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.
For sale only in the U. S. A. and its Territories and Canada

B·S

BROWN & SHARPE



Midwest Tools are inspected under the comparator—a highly sensitive shadowgraph device where a variation of .001" can be detected with the naked eye.

MIDWEST FORM TOOLS

These Midwest Tools in various forms: Circular, Flat and Dovetail, guarantee extreme accuracy in screw machine production work . . .

Send in parts prints, specify material to be cut, machine to be used. Ask for Bulletin 16D.

MIDWEST TOOL & MFG. CO.
2356 W. Jefferson Ave., Detroit, Mich.

MIDWEST
manufacturers of
PRECISION METAL CUTTING TOOLS
for more than 30 years

Milling Cutters • Sleeves
Counter Bores • End Mills
Reamers • Special Tools
Form Tools • Adjustable Holders • Carbide Tipped Tools

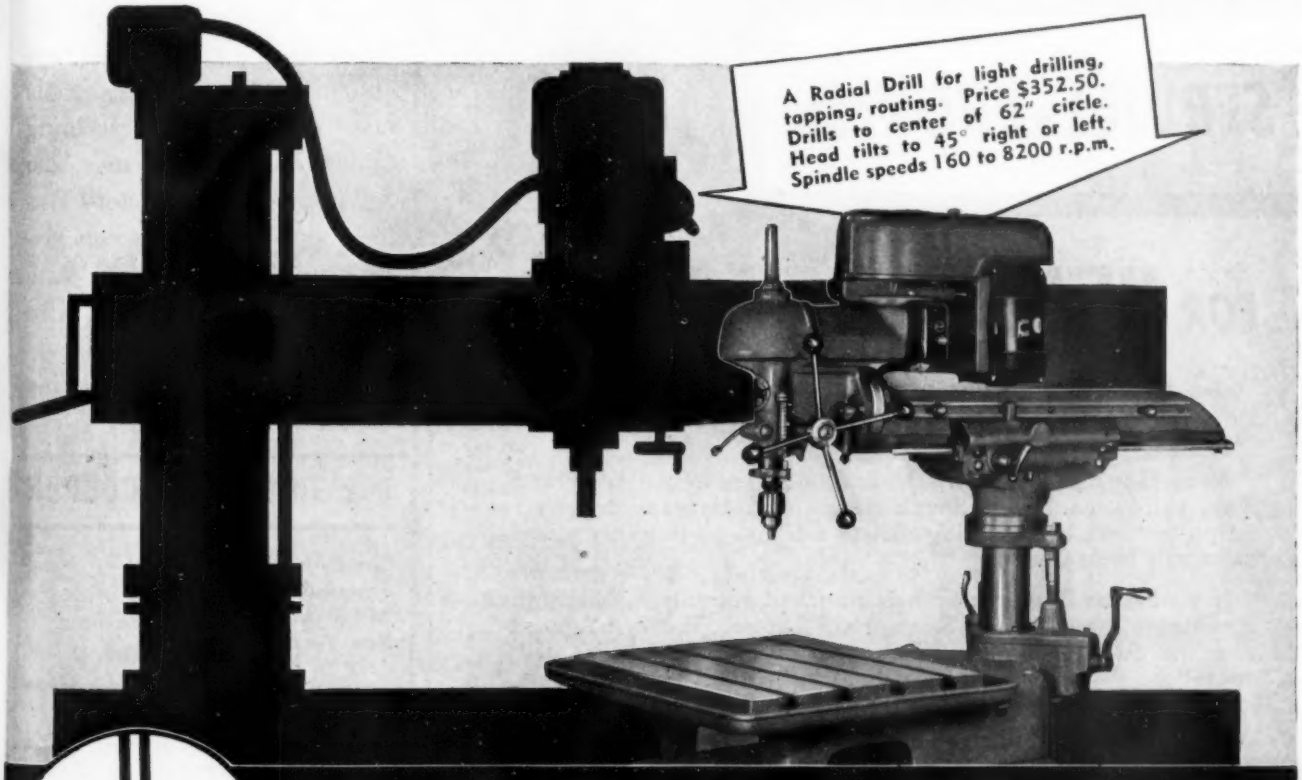
THERE'S A LESSON IN THIS WAR . . .

FOR MACHINE TOOL USERS!

The war proves that light, fast PT boats and destroyers are as important a part of a fighting navy as heavy battleships. In war plants, too, industry finds that Walker-Turner fast, compact, well-built machine tools are as essential to today's enormous production program as the heavier units. Management, alert to improved methods, shows growing preference for Walker-Turner Machine Tools because: (1) They are quickly available, (2) Their weight conservation is effected by careful design and discriminating selection of material, (3) Prices are low, (4) Unskilled labor finds them easy to operate.

Our new catalog will give you a better idea of this vital industrial development.

WALKER-TURNER COMPANY, INC.
4553 Berckman Street, Plainfield, N. J.


A Radial Drill for light drilling, tapping, routing. Price $352.50. Drills to center of 62" circle. Head tilts to 45° right or left. Spindle speeds 160 to 8200 r.p.m.

walker-turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Sommerfeld LATHES

SERVICE-PROVED

FOR HEAVY-DUTY WORK

Today in War Production plants, Sommerfeld Lathes are upholding the fine reputation they earned in peace times for ruggedness and dependability.

More than thirty years lathe-building experience is behind these sturdy machines. Sound design and precision manufacturing methods combine to produce machines admirably suited to today's severe needs.

If your work requires both boring and turning, you should investigate the type BT Sommerfeld Lathes. These machines turn the outside and bore the inside **simultaneously**, both operations being performed at different feeds! You save time, labor, floor space.

Sommerfeld
MACHINE COMPANY
BRADDOCK, PA.
Makers of Machine Tools since 1895

Still a few copies left of this valuable issue of

AMERICAN MACHINIST

• ***Please send order promptly to insure delivery***

ANNUAL BUYERS REFERENCE NUMBER

Special issue of Jan. 21, 1943 . . . price $1 postpaid

Biggest issue of the year! Invaluable as a guide to the new and improved machines, tools and equipment — describing almost 1,000 such items. Also a Where-to-Buy Directory listing suppliers of every conceivable metal-working need, with 600 reference headings. Also contains a valuable list of Sub-Contractors for Manufacturing or Services.

USE THIS HANDY COUPON

Circulation Department,
American Machinist,
330 West 42nd Street,
New York, N. Y.

Enclosed is ——— for which please send me:

—— copies of Jan. 21, 1943 Buyers Reference Number at $1.00 a copy

Name .....

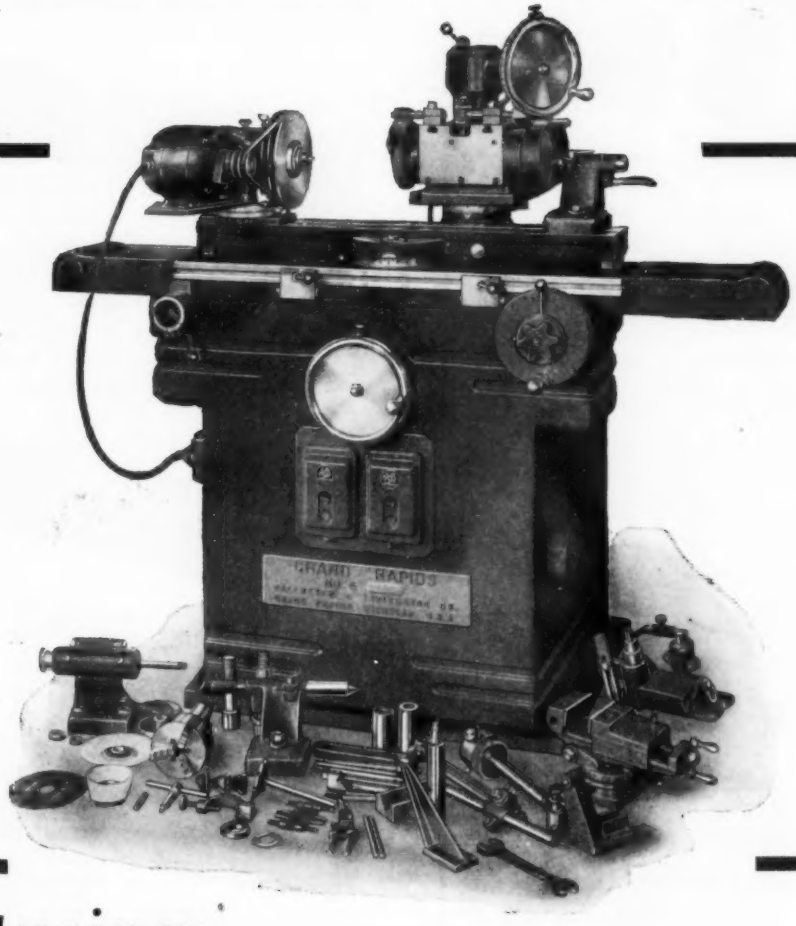
Street Address .....

City .....

State .....

GRAND RAPIDS

No. 6 Universal Cutter and Tool Grinder



Featuring:

If interested in a Universal Cutter and Tool Grinder having these and other equally desirable features, ask for Bulletin 11-1-41.

Cabinet Base Construction
Ball bearing table
Hardened and ground stainless steel table ways
Fixed table height
Cross feeding of column rather than table enabling operator to stand up close to his machine
Convenient location of all controls
All wheel shafts mounted on grease-sealed ball bearings
Provision for built-in dust collector

GALLMEYER & LIVINGSTON CO.
330 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

IDEAL IS THE Speedy Way

TO BOOST PRODUCTION TO NEW HEIGHTS

IDEAL

LIVE CENTERS

Permit heavier loads and deeper cuts at higher speeds

Turn out MORE work in LESS time—on lathes, millers, grinders because they permit these machines to be run at full capacity. Radial load carried by high precision ball bearings; thrust load by taper roller bearing.

TRIPLE DUTY

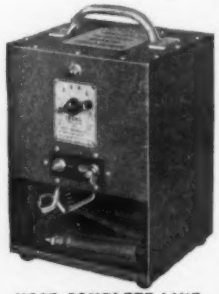
Save set-up time. 3 interchangeable inserts for all centered and uncentered work.

IDEAL METAL ETCHER

14 heats

Permanently marks all Iron, Steel and their Alloys.

New all-purpose Etcher for electrically marking important information on smooth-surfaced parts, tools, dies, gages, etc. 14 heats; 115 to 1300 watts, to meet all etching requirements. Etches legibly, easily, permanently, regardless of the hardness of the tool or the part. Heat-indicating lamp brightens as heat increases. Convenient ground clamp for etching large, heavy parts and castings.



MOST COMPLETE LINE ON THE MARKET

IDEAL "3 IN 1" JUMBO ELECTRIC CLEANERS

Increase Machine Life.

Prevent Shutdowns and make the machines and motors you have last longer—perform better—by keeping them clean with IDEAL "3 in 1" JUMBO Electric Cleaner. *Blows — Vacuums — Sprays.* Super-powered 1 H.P. Motor. Air velocity 24,200 ft. per minute. Removes all dirt from hard-to-get-at places.

FREE

Machine Tool Accessories catalog Tells you all about these and other Production Speeders — Demagnetizers, Marking tools, Balancing Ways, etc. Send for your copy today!

IDEAL COMMUTATOR DRESSER CO.

1057 Park Avenue **Sycamore, Illinois**
SALES OFFICES IN ALL PRINCIPAL CITIES
In Canada: Irving Smith, Ltd., Montreal, Quebec

TUNGSTEN CARBIDE TIPPED TOOLS

Price $1.00 Each In Any Size

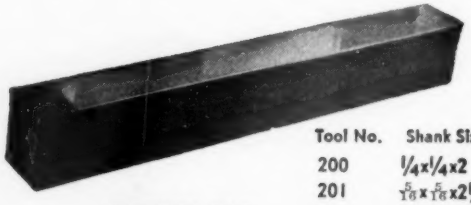
New Low Prices—Increase Production—Cut Operating Costs

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials such as hard rubber, bakelite, fibre, and tough alloy steels up to 500 Brinell hardness

Left Hand-Reverse Image. Right Hand Shown

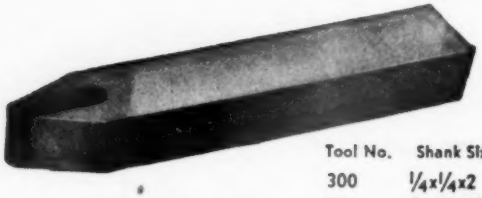
SERIES 100

Tool No. RH	LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2



SERIES 200

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2



SERIES 300

Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

Standard Tungsten Carbide Tipped Tool Bits

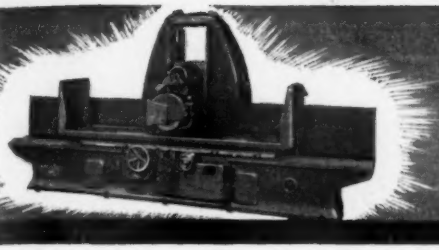
In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lots of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

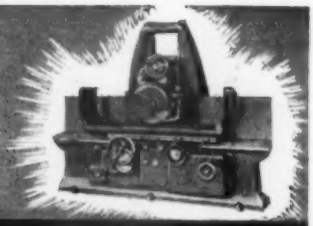
WE CARRY SILICON CARBIDE EMERY WHEELS FOR GRINDING TUNGSTEN CARBIDE TOOL BITS

Send for our latest circulars

VICTOR MACHINERY EXCHANGE, Inc.
251 CENTER STREET **NEW YORK, N. Y.**



MATTISON
HIGH-POWERED PRECISION SURFACE GRINDER



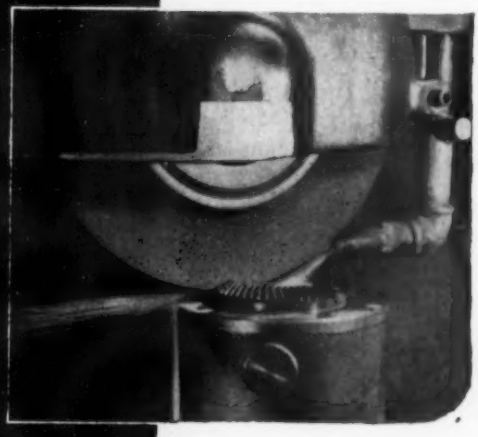
PRECISION RESULTS on a High Production Basis

Illustrations show one half of split gear, being ground to precision tolerances for matching with other half after grinding. These parts are minutely gauged and fitted together to become part of the mechanism that regulates the pitch position of the Curtiss Electric Propeller.

Here is another example, showing how Mattison Grinders are proving their worth in the production of aircraft parts where close precision and huge output are required. Mattison Grinders are built in table sizes from 12″ to 36″ wide, 36″ to 192″ long. They incorporate massive, double column support for wheel head, ruggedness of construction and ample power for rapid stock removal that insures consistent precision results on a high production basis.

Making an adjustment on a power unit of a Curtiss electric propeller prior to take-off.

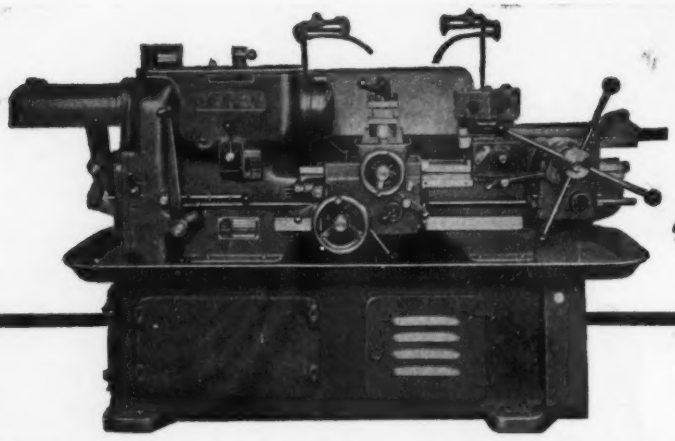
Mattison Grinder in production on split gear which is part of Curtiss electric propeller mechanism.



SET-UP SHEETS Containing complete information regarding these and similar jobs will be sent upon request.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS



MOREY DESIGNED AND BUILT
FOR PRECISION *PLUS* PRODUCTION

TURRET LATHES FOR BAR OR CHUCKING WORK

Infinite spindle speeds . . . Multiple disc clutch . . . Power feeds for the turret and cross slide . . . 8 feed changes available...Timken bearing . . . Self-locking turret . . . Automatic stops . . . Turret clamps and unclamps automatically . . . Independent adjustable stop for each turret face.

No. 2 TURRET LATHE
1" hole in spindle, 6" turning length, 14" swing over bed. Infinite spindle speeds 60 to 2000 RPM, constant speed motor, 1800 RPM.
Ask for Circular No. 629A

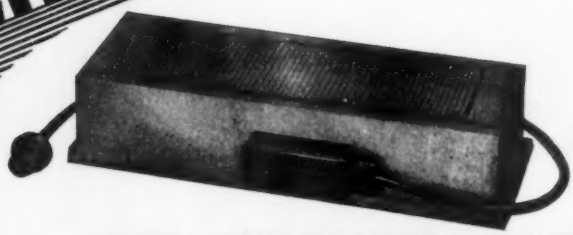
No. 3 TURRET LATHE
1½" hole in spindle, 10" turning length, 16½" swing over bed. Infinite spindle speeds 55 to 1800 RPM, constant speed motor, 1200 RPM.
Ask for Circular No. 727A

No. 4 TURRET LATHE
2" hole in spindle, 12" turning length, 19½" swing over bed. Infinite spindle speeds 35 to 1500 RPM, constant speed motor, 1200 RPM.
Ask for Circular No. 736A

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

WALKER MAGNETIC CHUCKS

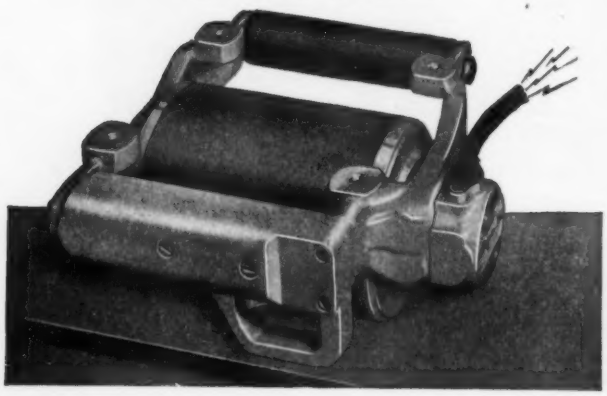
Style B Face Plate — in standard diameters from 10⅜" to 36⅛" inclusive.



No. 617 Bar Pole Face Rectangular Magnetic Chuck.

DEMAGNETIZERS

Walker DEMAGNETIZERS are available in standard D.C. and A.C. types for either 110 or 220 v. Ask for Bulletin K7 giving detailed specifications.



A FULL LINE OF PROVED STANDARD DESIGNS

Walker offers prompt and complete service on magnetic chucks by carrying in stock a considerable line of Rectangular and Rotary types for use on all surface and internal grinding machines built by American machine tool manufacturers. These units—for grinding, milling, planing and turning operations—are of proved design and are available in such a complete range of sizes as to enable you to select standard units for practically any chucking problem. Write for bulletin W4 giving detailed information.

Also special CHUCKS *for special* NEEDS

The design of Walker Magnetic Chucks is such that "specials" can be developed and furnished at prices only slightly more than standard units. If you require special magnetic chucks for special purposes, consult Walker and be assured of prompt, economical service.

O. S. WALKER CO., INC.
WORCESTER, MASS.

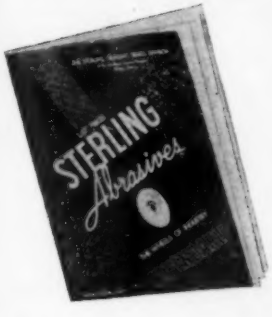
Two New STERLING AIDS for FASTER COOLER GRINDING

Sterling's STERFAST Grinding Wheels and Segments are now available for cooler, faster grinding of your hardest steels. Made in various formulae, these new wheels and segments are your positive answer to the problem of obtaining faster stock removal without burning on certain types of metals.

If you are looking for better-than-ordinary grinding results, STERFAST will give them to you. Here is easier, free-cutting without dressing...wheels and segments that remove metal fast ...that provide extra long life and reduction of grinding time.

For example do you need to speed up production on tool, cutter and surfacing jobs? If you do, then these two Sterling innovations will do it for you at less cost and without lost time for dressing.

Quicker grinding...better grinding...controlled grinding--these are some of the features of Sterling's STERFAST Grinding Wheels and Segments. Every quality you have previously found to be desirable features of Sterling Wheels and Segments has been incorporated in these new items. Write today for Sterling engineer to call.



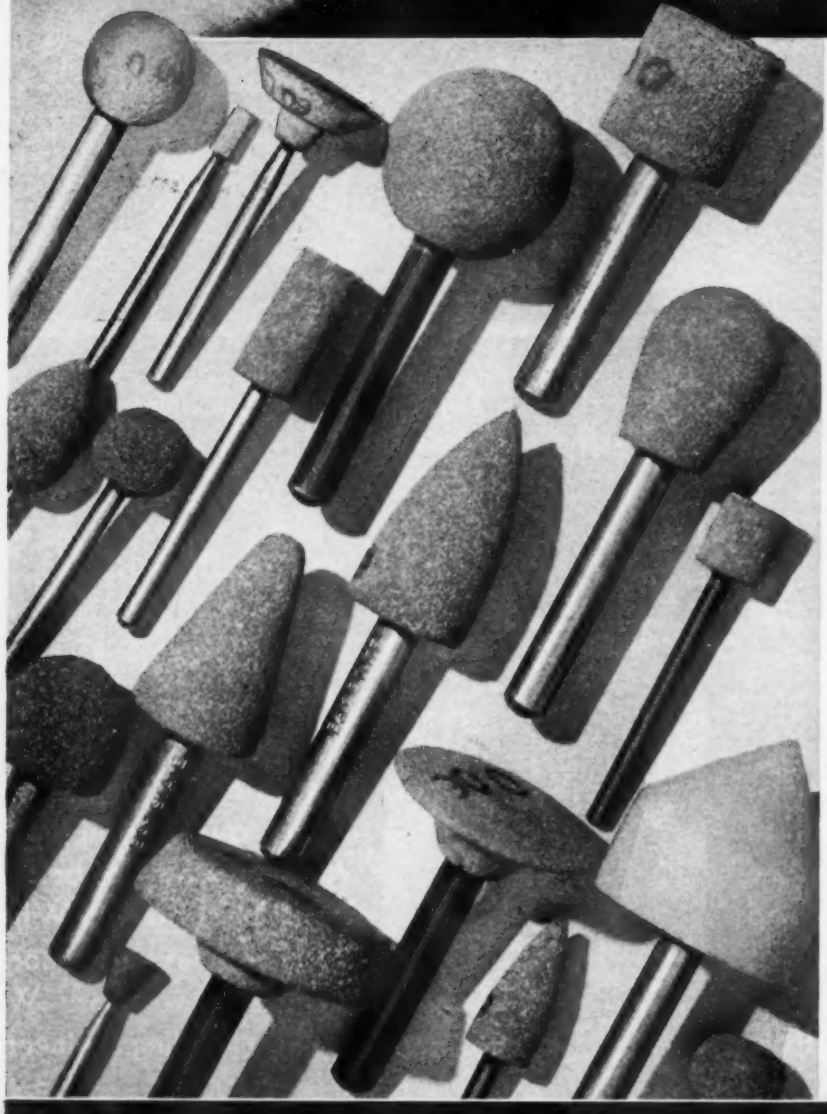
A full range of grinding possibilities is described in the new Sterling Catalog No. 43, just off the press. Send for it on your letter head and a copy will be mailed at once.

· STERLING ABRASIVES ·

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

A little touch MEANS SO MUCH!



There are several honest-to-goodness reasons why BAY STATE wheels and points are preferred for those innumerable, fussy jobs on moulds and dies.

1. They are pressed into uniform blanks, assuring grade hardness.

2. They are formed absolutely true on BAY STATE precision lathes.

3. They are ready for immediate cutting action — in a myriad of shapes and sizes.

4. They can be used completely down to the spindle.

5. They will not come off the spindles.

6. They are free from "hard and soft" spots.

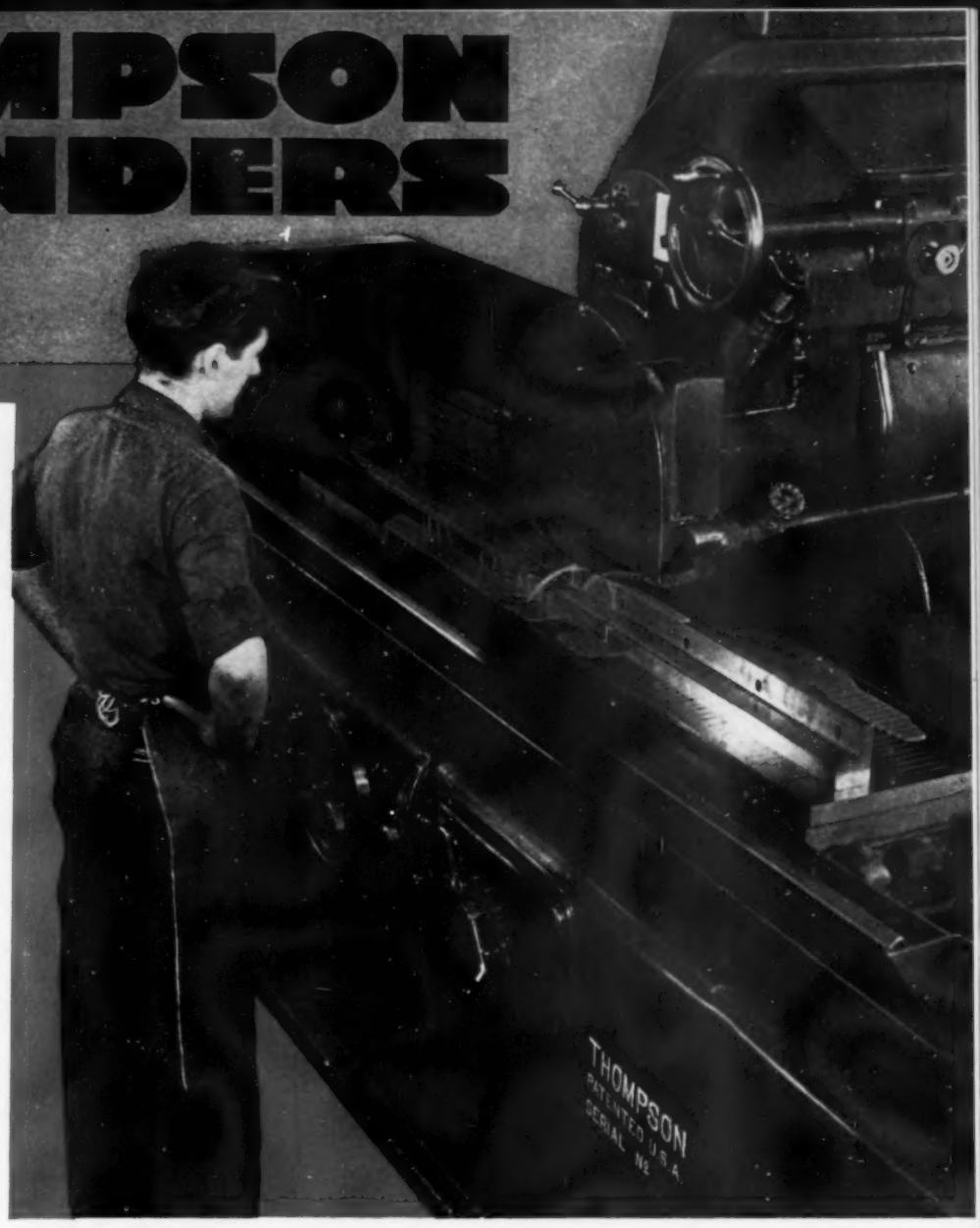
Send for illustrated catalog and bulletin containing standard stock and mandrel specifications.

BAY STATE WHEELS of PROGRESS

BAY STATE

ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

THOMPSON GRINDERS



Precision ground parts for precision built lathes

● This type C Thompson Grinder installed in the plant of one of the pioneer manufacturers of Turret Lathes is maintaining particularly close tolerances on a wide range of work.

The motor mounted directly on the grinding spindle not only eliminates excessive maintenance but provides greater power and a drive that is permanently trouble free and vibrationless.

The hydraulic drive to table permits higher feeds and speeds—smooth vibrationless operation—and the use of new type free cutting grinding wheels resulting in a fast, cool cutting operation and less distortion in the work.

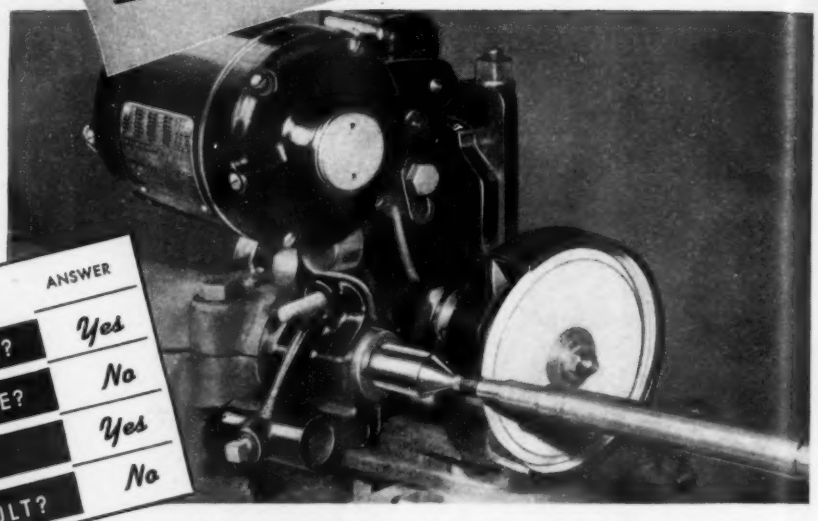
For dependable accuracy over long periods make your next grinder a Thompson.

Thompson Grinders are built in a wide range of types and sizes. Largest Type C—36"x36"x220".

THE Thompson GRINDER CO.

Thread Grinding Simplified

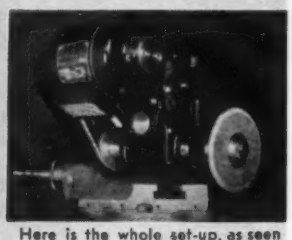
WITH DUMORE GRINDERS



QUESTION	ANSWER
ACCURATE?	Yes
EXPENSIVE?	No
QUICK?	Yes
DIFFICULT?	No

Horizontal mounting post has location lugs for quill and graduations for setting helix angle.

Just a healthy handful, grinder goes onto post and into automatic alignment with lugs.



Here is the whole set-up, as seen from back of lathe. Motor is up and back from the work.

Dresser clamps to tail stock. Stroke-action lever moves diamonds across faces of wheel.

Arrow shows graduated arc for setting wheel dresser to same helical angle as the grinder.

Any lathe that will cut a thread becomes a thread grinding machine by putting in place of the chasing tool a Dumore No. 5 Precision Grinder and thread-grinding attachment. You can grind threads from solid stock, or finish-grind threads roughed out with cutting tools. It is the ideal way to restore accuracy after the distortion that occurs when a roughed-out thread is hardened. ★ On external threads you can grind any pitch and diameter the lathe will handle. On internal threads there are a surprising range of depths, pitches and diameters which can be handled with the Dumore internal grinding quills. You can hold the tolerance within the regular Dumore limit of a tenth (.0001"). The secret of this time-saving, machine-saving system is a simple set-up with mathematically accurate adjustment of helix angle; plus an equally accurate device for diamond-dressing the wheel to perfect profile. Dressers are available not only for regular 60-degree threads but for Acme and other special thread forms. ★ Make use of the versatility of the Dumore No. 5 to turn out perfect threads... take advantage of its speed and precision for cylindrical, taper, and flat grinding on lathes, boring mills, planers, and other machine tools. Dumore Precision Grinders and attachments are available through industrial distributors.

Dumore

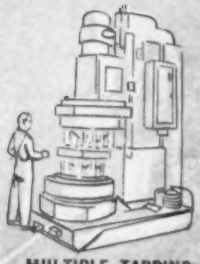
Write for special bulletin on thread grinding

THE DUMORE COMPANY
Dept. 133-E RACINE, WISCONSIN

PRECISION GRINDERS

7 SIZES . . . 54 QUILL COMBINATIONS

Floating Holders



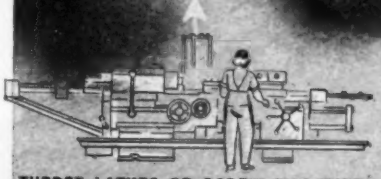
MULTIPLE TAPPING

DRILL PRESSES

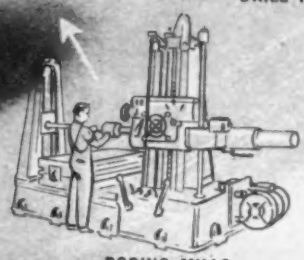
THE Scully-Jones Ball Bearing Type Floating Holders drive and float on Ball Bearings for a smooth rolling action... compensating for misalignment between machine spindle and work.

Eliminate scrap from Bell-Mouthed or oversize holes when reaming or precision tapping on AUTOMATIC SCREW MACHINES, LATHES, TURRET LATHES, DRILL PRESSES or MULTIMATIC MACHINES.

Optional Straight, Threaded or Tapered Shanks... Collets with Straight or Tapered holes.



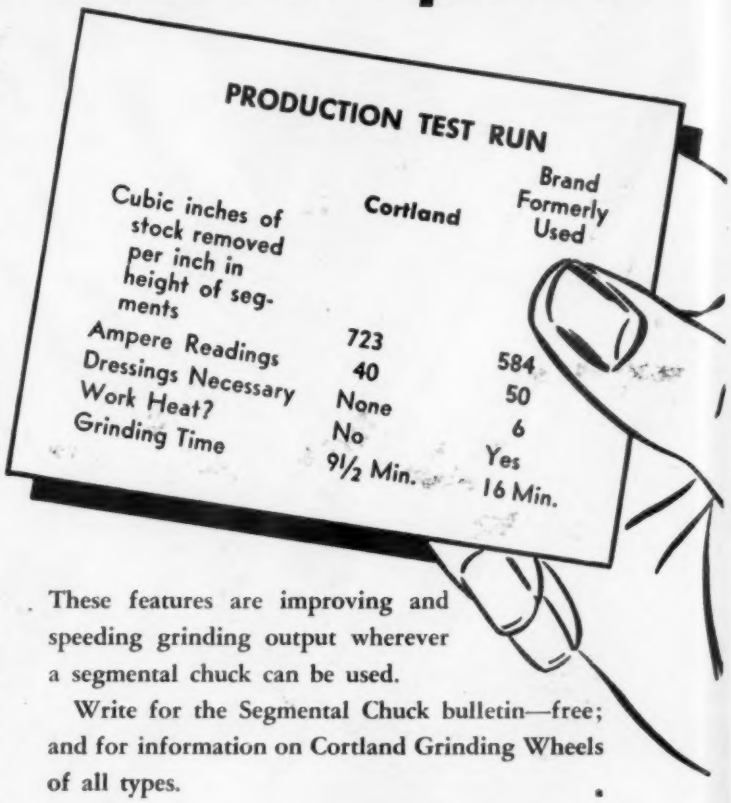
TURRET LATHES OR SCREW MACHINES



BORING MILLS

Scully-Jones
AND COMPANY
1901 SOUTH ROCKWELL STREET ★ CHICAGO, U. S. A.

We'll let this Record Speak for ITSELF



THIS Production Test Run showed performance of Cortland Chuck and Segments to be *outstanding in so many ways* that we're giving you the detail without any fancy headlines.

The test took place in a large war plant producing armament. Flat surface grinding of machine gun part was done on a Blanchard No. 18 Vertical Surface Grinder; wheel speed 705 R.P.M. Surface ground per piece, 2.52 sq. in.; 160 pieces per table load.

The use of Cortland Chuck and Segments produced better finish, entailed far less wheel wear—and required less grinding time for the work.

Records like these are not magic. They simply show the sound common sense engineering that is back of *Diagonal Shearing,* as embodied in the design of Cortland Chuck and Segment Assemblies.

These features are improving and speeding grinding output wherever a segmental chuck can be used.

Write for the Segmental Chuck bulletin—free; and for information on Cortland Grinding Wheels of all types.

DIAGONAL SHEARING
Shock and resistance minimized as narrow end of segment starts grinding action. Large surface still exposed to coolant. Diagonal motion of straight inner edge of segment produces powerful shearing action. Increasing contact combines rapid stock removal with minimum heating.
Maximum area of segment in contact with work momentarily. As segment continues to pass across work, grinding area becomes smaller, with more surface exposed to coolant.

CORTLAND *Segmental Chucks*

CORTLAND GRINDING WHEELS CORP. • CHESTER, MASS.

WEAPONS OF CONSTRUCTION!

The craftsmen making National cutting tools today know that they are making more than tools. They know they are making weapons —the weapons with which weapons are made.

In your hands these tools deserve the same care and attention that a soldier gives his rifle. Keep them fighting by keeping them working. Keep them working by keeping them sharp.

NATIONAL

NATIONAL TWIST DRILL & TOOL DETROIT U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

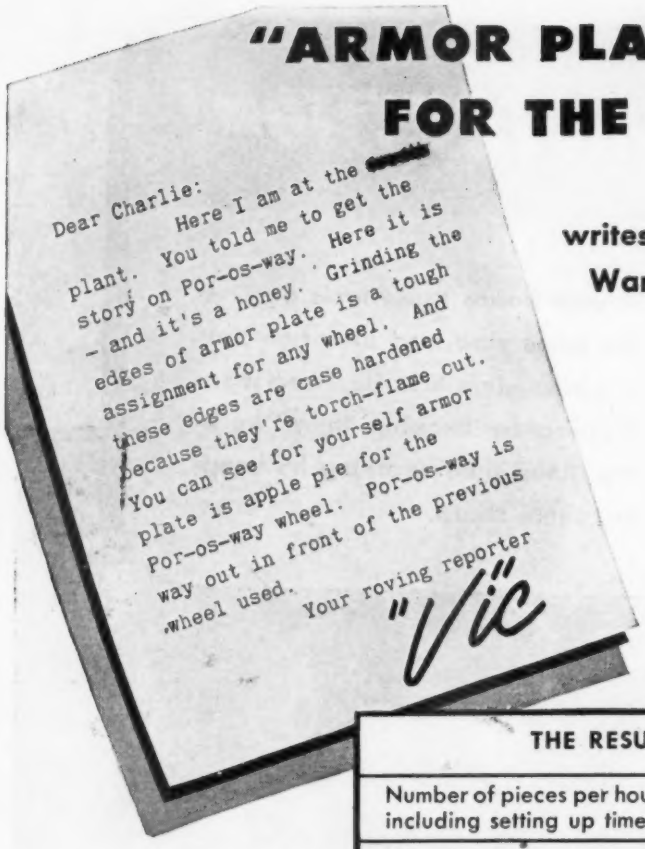
TWIST DRILL AND TOOL COMPANY

HOME OFFICE AND FACTORY—DETROIT, MICH.

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

"ARMOR PLATE IS APPLE PIE FOR THE POR-OS-WAY WHEEL"


Dear Charlie:
Here I am at the plant. You told me to get the story on Por-os-way. Here it is – and it's a honey. Grinding the edges of armor plate is a tough assignment for any wheel. And these edges are case hardened because they're torch-flame cut. You can see for yourself armor plate is apple pie for the Por-os-way wheel. Por-os-way is way out in front of the previous wheel used.
Your roving reporter
"Vic"

writes POR-OS-WAY'S War Plant reporter

THE RESULTS	POR-OS-WAY WHEEL	FORMER WHEEL
Number of pieces per hour, 4 sides per piece including setting up time	5	2
Wheel dressing required	None	Every 6 or 7 pieces
Life of Wheel	4.5 days (108 hrs.)	½ day (12 hours)
Average depth of cut per pass	.008" to .125"	.006" maximum
Speed of removal for 30" of edge	2 minutes	20 minutes
Number of passes required	7	15
Time per pass	2½ seconds	4 seconds (wheel chipped at faster speeds)
Number of man-machine hours per month, 3 men on 3 machines; 8 hours, 3 shifts, 30 days per month	2160	
Number of pieces finished (4 sides) per month—including setting up time	10800*	4320
Monthly increase in production through use of Por-os-way Wheel	**6480** pieces	2½ times **more** than previously

THE JOB:

Removing average of ¼" stock from all four edges of ½" and ¾" armor plates, consisting of mild steel one side, hardened steel (600 Brinnell, 35-37 Rockwell) on the other. Torch cutting case hardens the edges. Three Rogers grinders used.

THE WHEEL:

Por-os-way segments — 4⅛" x 1¼" x 4" A24KV2.

All facts and figures given are taken from an actual field survey made by a Por-os-way correspondent.

WRITE ***for complete booklet "Facts About Por-os-way". The address is 430 Wheatland St., Phoenixville, Penna.***

*Por-os-way actually removed stock 10 times faster than previous wheel but inclusion of setting up time, being a proportionately large factor, reduces ratio to 5 to 2.

2 TO 5 TIMES MORE WAR PRODUCTION PER MAN PER MACHINE

POR-OS-WAY* *a new* RADIAC* PRODUCT

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.

COPYRIGHT, 1943, A. P. de Sanno & Son, Inc.

FIRST AID FOR THE TOOL ROOM

Today's production program demands accurate, efficient cutting tools **within easy reach.** Gairing standard kits (particularly recommended for tool rooms, machine, die and repair shops) provide the answer for all counterboring, countersinking and spot-facing operations.

There are seven sets from which to choose. Set B-4 is illustrated here. Each contains tools designed with special features to meet different requirements—each is a logical assortment of **interchangeable** counterbores, pilots and holders neatly boxed in sturdy wooden cases with stout hinged covers.

Write us today for our four-page Counterbore Bulletin illustrating, describing and pricing all seven sets.

The **interchangeable** holders in these sets are of Morse Taper or straight shank type. (Optional.) Threaded shank pilots are of selected alloy steel hardened and ground on the head. Shanks are drawn and treated to obtain unusual toughness and strength. High speed steel counterbores are renewable. The use of these **interchangeable assemblies** assures large savings over the old fashioned solid integral pilot type.

All counterbores, pilots and holders selected are standard items of the most active sizes used. Replacements may be quickly obtained from stock.

Gairing Interchangeable Counterbore Set No. B-4

THE GAIRING TOOL COMPANY, Detroit, Michigan

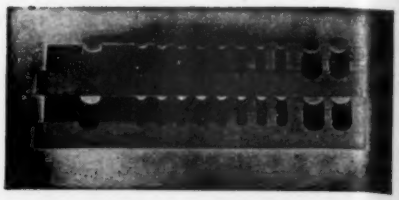
Manufacturers of Standard, Special and
Gair-Lock Inserted Blade Cutting Tools

DRESSING IS SIMPLIFIED . . . *by the New Time-saving C-66 . . .* RADIUS DRESSER FOR SURFACE GRINDERS

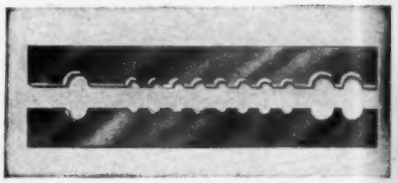
This low-priced, rugged attachment, for any make of surface grinder, dresses wheel without dismantling machine. Mounts directly on magnetic chuck. Does a one hour job in 10 minutes—accurately—conveniently.

NOTE how this Radius Dresser and two High Speed Tool bits replace an expensive Jig Boring Machine.

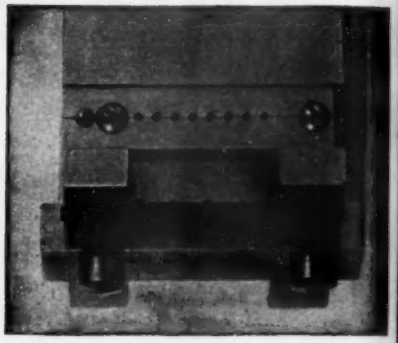
Drill Jig made with two high speed tool bits ground together on surface grinder, eight .062 holes, two screw holes, one dowel pin-hole. No drill bushings, no lapping, no hardening. Grinding time two hours fifteen minutes. Simple, easy, quick.



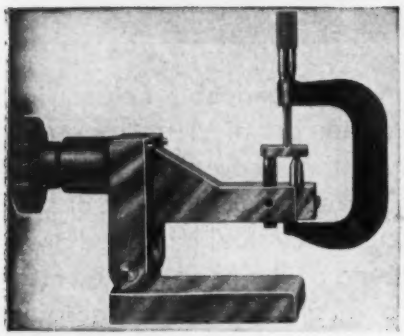
Two High Speed Tool Bits ground for drill jig.



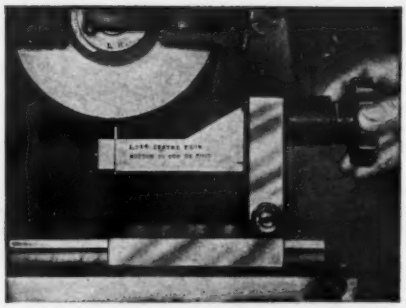
Drill Jig ready to assemble.



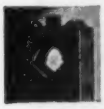
Drill jig completely assembled.



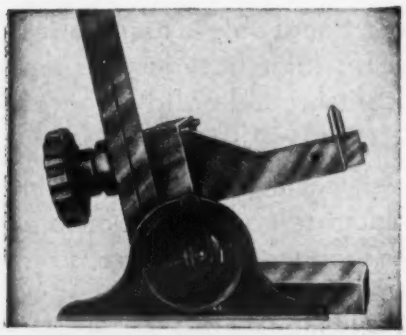
The diamond is set by simply measuring with micrometer from top of hood to bottom of arm.



The C-66 provides an important safety feature in that hands are kept away from under the wheel.



The diamond holder is held against a ground vee in the arm. By means of this construction any size diamond up to ⅜" can be held accurately in line with the vertical center line of spindle.

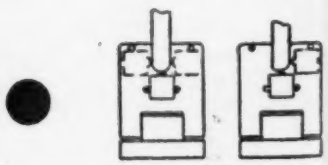


For dressing wheels for grinding turning tools, the dresser is set at angle equal to clearance angle of tools. The C-66 is the only radius dresser with this feature.

Long Wearing Chisel Point Diamond

.013 Male and Female Radius

.500 Male and Female Radius



180° and 90° Male Dressing

Prompt delivery from factory in Newark, N. J. Price, without diamond, $82.50, ¼ K diamond, $5.00.

SCHULTZ & ANDERSON CO.

MACHINE TOOLS

109 C EDISON PLACE NEWARK, N. J.

Speeding Up AIRCRAFT WORK

In this prominent eastern aircraft plant...Defiance Mills are answering America's call for *faster production* with *utmost accuracy!* Shown here is a Defiance Horizontal Boring, Milling, Drilling and Tapping Machine in this plant—doing its share to put more planes on more fronts—quickly. The main spindle of this machine has speeds from 12 to 1000 r.p.m.

Throughout war plants today... more and more Defiance Machines are helping win the "battle of production"... where speed, accuracy and rugged simplicity of design are essential. Because Defiance Engineering has solved so many tough machinery problems... Defiance performance is widely recognized among shop men as "tops" in precision, ruggedness and dependability. See our insert in Sweet's Mechanical Catalog or write for latest bulletins. Defiance Machine Works, Inc., Defiance, Ohio.

Makers of Precision Machinery Since 1850

Horizontal **BORING..MILLING..DRILLING..TAPPING** *Machines*

DEFIANCE

SUNNEN HONING Provides a finish of 2 to 3 micro-inches—

and at a Saving of 35% in time!

Battery of 6 Sunnen Precision Honing Machines in completely air-conditioned room — honing to .0001" tolerance.

Accuracy — and a super-smooth finish with a real increase in production which means a saving in cost. That's the record of the Sunnen "MA" Precision Honing Machine in the modern plant of the Fidelity Machine Company.

This one example is indicative of the many reasons why hundreds of leading manufacturers handling important war contracts have adopted Sunnen Honing.

Consider These Advantages

Wide range—handles internal diameters of .185" to 2.625". Accuracy within "one-tenth" guaranteed—has been held to .000025" on production jobs. Relieves big internal grinders for other jobs. Corrects errors of out-of-roundness or taper caused by previous operations. Facilitates duplication of sizes. Does not require skilled labor. Practical — inexpensive — economical to operate.

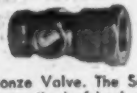
Put Sunnen Honing to work in your plant!

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Saved time in producing a smooth, accurate finish on this bronze remote control valve body.

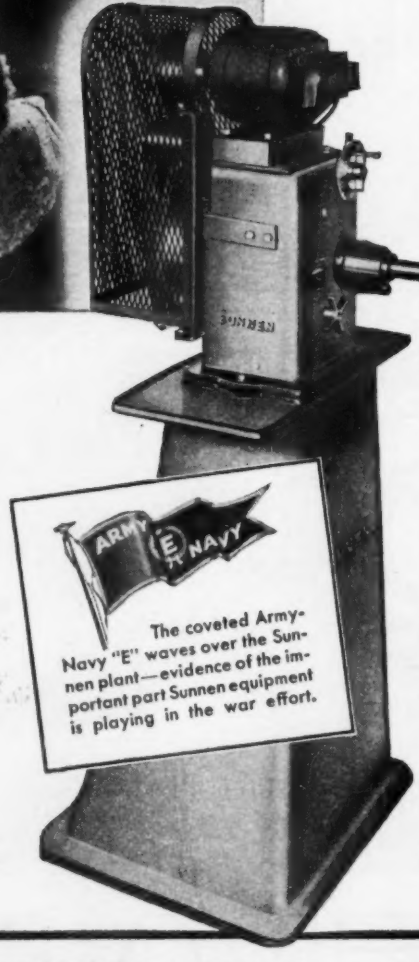
Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Tappet Roller. 4-Micro finish.



Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

"Strict alignment maintained between two holes."



The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN

SUNNEN PRODUCTS COMPANY — 7941 Manchester Avenue, St. Louis, Missouri

Canadian Factory: Chatham, Ontario

CHATTERLESS COUNTERSINKS

BANISH CHATTER BY USING A SHEARING CUT

Because of their unusual design, Severance chatterless countersinks have proven to be remarkably efficient tools for a wide variety of production and job work. They take an unusually heavy, shearing cut, they eliminate chatter, and they leave a good, smooth seat. Severance Countersinks are available in various combinations of angles, shanks, diameters and lengths. Ballnose, and double-angle may be had. The Heavy Duty Severance Chatterless Countersink has a tanged shank and may be used with a Glenzer sleeve.

* * *

Because Severance Midget Milling Cutters are hardened to 63-65 Rockwell C and then precision-ground from the solid, they take deep, sharp bites and speed up the finishing of plastic, wood, metal and alloy castings and patterns of any kind.

* * *

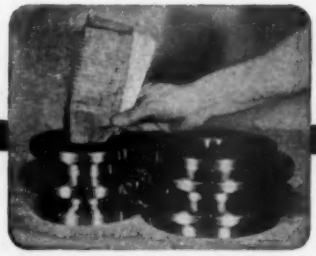
Severance 72-hour regrinding service and "Severite" hardening process renews your worn tools at a fraction of new tool cost.

Enlarged view of a Heavy-Duty Severance Chatterless Countersink (with tang) and a Severance Standard Chatterless Countersink.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • SEVERANCE TOOL INDUSTRIES, INC., SAGINAW, MICH.
PLANTS IN LONG ISLAND CITY, N.Y.; DETROIT, MICH.; FORT WAYNE, IND.; CHICAGO, AND LOS ANGELES

Just what the Roll-Grinder ordered!



FOR the first time it has ever been done . . . the best ideas gained by years of experience in a production roll-forming shop, have been engineered and built into a grinding machine. Specially designed for the grinding of rolls, it does this job quicker and easier. Its set-up facility lowers costs and the handling ease reduces the fatigue factor. Both are of paramount importance in the efficient operation of the grinding of rolls.

"The Yoder ROLL-GRINDING MACHINE HELPS TO *Keep 'Em Rolling!"*

Yoder

ROLL-GRINDING MACHINE

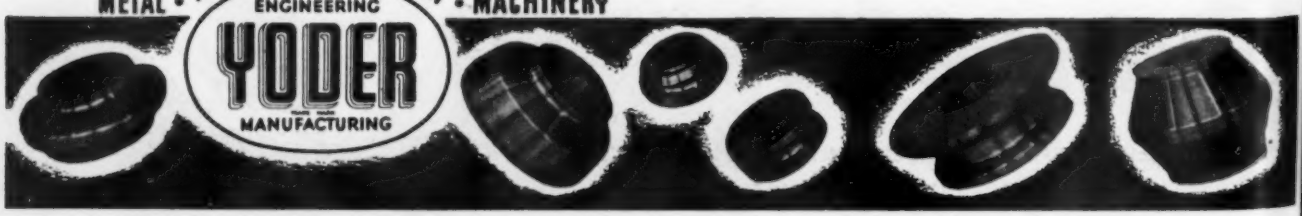
- Capacity 16″ diameter, length 20″ between centers.
- Manually synchronized table and cross feeds.
- 2 speed table feed.
- 9 speed work head drive, without belt or gear change.
- Precision built high-speed spindle.
- Dust protection.
- Centralized controls.

WRITE or WIRE or PHONE for Bulletin, Delivery or Price Information.

THE YODER COMPANY
CLEVELAND, OHIO, U.S.A.

METAL • FORMING • PRODUCTION • MACHINERY

ENGINEERING YODER MANUFACTURING



50 YEARS OF
WORK *and* WORRY

but win!

Baush is proud of the fact that it has contributed so much towards turning out machines which have played so great a part in boosting war production, (as symbolized by the Army-Navy "E" Flag to which, on February 6, 1943, has been added another Star).

ARMY E NAVY

BAUSH

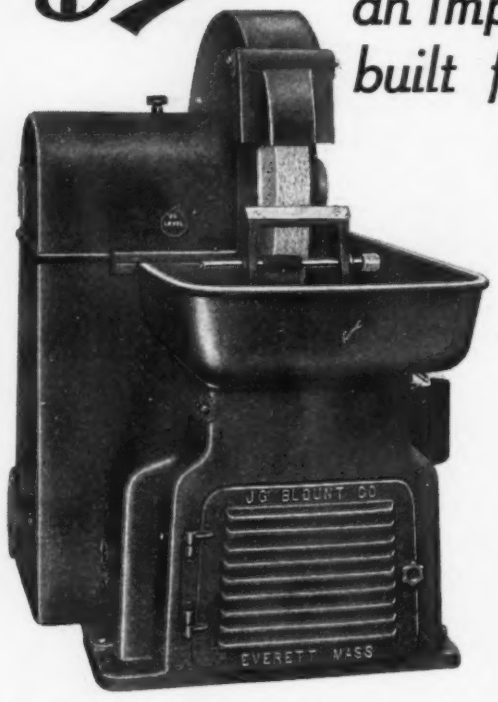
Pioneers for fifty years in the development of Multiple Spindle Drilling, Tapping and Boring [illegible] special equipment. Baush is going strong and continuing to improve designs and machines to assure even greater productivity of the arms that will ensure Victory.

BAUSH MACHINE TOOL COMPANY

Springfield, Mass. *Detroit, Mich.*

"Blount" MODEL H WET TOOL GRINDER
30 INCH

an Improved, Modernized Machine built for long, hard service . . . .



Designed for tool room or shop service this improved machine can be depended on for grinding large tools for heavy production machines. Outstanding performance is definitely assured.

Among the many features offered are:

. . . Timken tapered roller bearing pillow block with constant oil flow.
. . . Combination tool rest and wheel dresser.
. . . Filter tank with removable strainer located just inside rear ventilator door. This tank filters coolant before passing through centrifugal pump. A shut off valve placed between this and main coolant reservoir provides the means of closing system before removing filter strainer for cleaning, etc.
. . . A 5 HP motor is mounted in air-flow base, for cool running and easy accessibility.
. . . Provision is made for quick wheel change.
. . . Wheel is adjustable for balance and bearings are adjustable for wear.
. . . 4-V belt motor drive is completely adjustable.

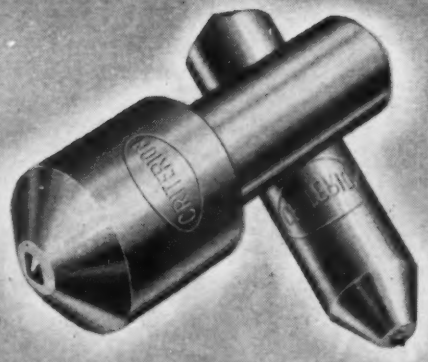
CONDENSED SPECIFICATIONS

Floor to center of spindle—38"
Pan—52" long, 26" wide, 8" deep
Spindle Speed—720 R.P.M.
Pump Speed—1050 R.P.M.
Dimensions of base—38½" x 30¾"

Write for descriptive literature giving complete information

J. G. BLOUNT CO.
Everett, Mass., U. S. A.

CRITERION *Diamond* TOOLS



For **STEADY PRODUCTION**

Dependable diamond tools are vital in present production schedules. Every day more users are turning to Criterion Diamond Tools for the kind of service which they must have. Quality of diamonds used plus a unique method of setting assures extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Order direct. Request free literature.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

ACROMARK
numbering, stamping and marking machines and accessories are extensively used where fast, accurate permanent work is a prerequisite.
THE ACROMARK CO. ELIZABETH NEW JERSEY

TO HELP YOU TEACH THE NEW GRINDER HAND

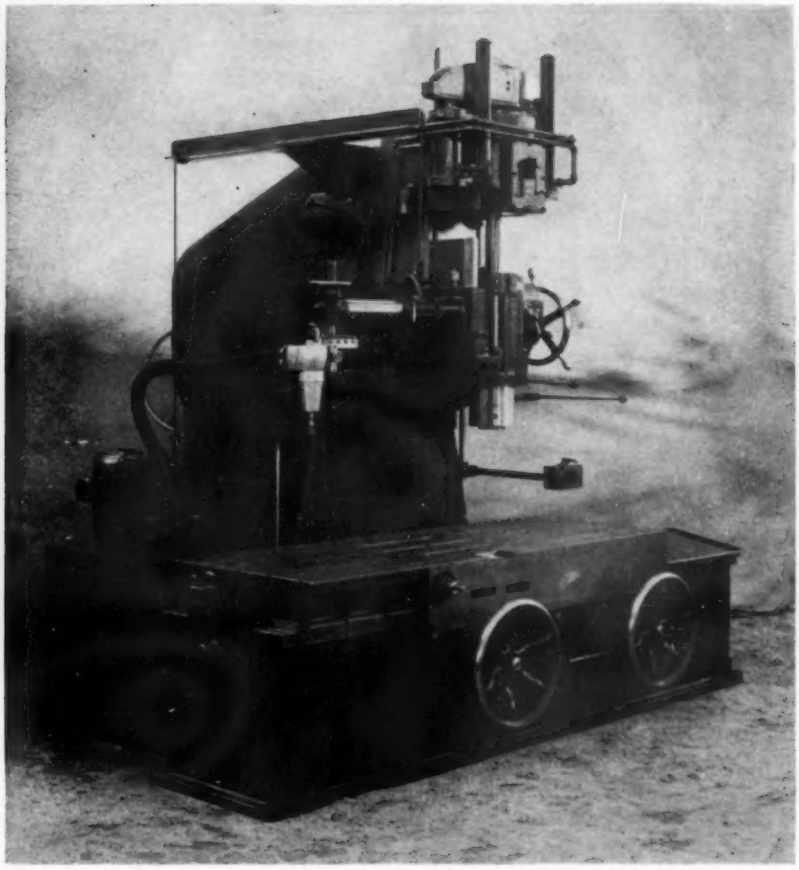
how to get maximum service from your Diamond Tools—we have some effective training material. Send for it. No obligation.

KOEBEL DIAMOND TOOL CO.
9345 Grinnell Ave., Detroit

KAEBELITE DIAMOND TOOLS
Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for All Industrial Purposes.

The NEW FITCHBURG

Heavy Duty DIE SINKING MACHINE



The machine shown here is equipped with a Turchan follower for duplicating dies from a mold or a master die. In addition to the 60" table length, a 24" extension, riding on the bed and bolted to table, is provided for carrying the pattern to be duplicated.

Specifications:

- Table 30" wide x 60" long over working surface
- A circular table 24" in diameter is built into each table at left hand end of main table.
- Circular table has radial movement from front of table.
- Distance top of table to under side of spindle—15" minimum, 33" maximum.
- Depth of throat from center of table to face of column—23½"
- In and out adjustment of ram that carries spindle head—30"—15" each side of center of table
- Table Feeds—8- from ½" to 4" per minute
- Ram Feeds—8- from ½" to 4" per minute
- Spindle Speeds—18- from 33 R.P.M. to 1000 R.P.M.
- 15 H.P. motor to spindle drive

FITCHBURG ENGINEERING CORPORATION

FITCHBURG, MASSACHUSETTS

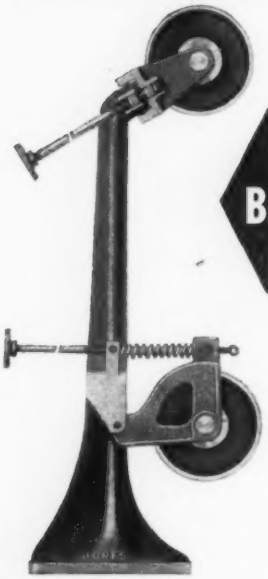
Do you operate precision grinders that require sharp pointed diamonds? Then you require our sharp cornered Octahedrons which you see surrounding this ad.

They are carefully selected by our diamond experts for long wearing qualities. They are not cheap, but they are economical.

Don't delay trying them. Send your inquiry today.

F. F. GILMORE & CO. 285 Columbus Avenue, Boston, Mass.
2834 East Grand Blvd., Detroit, Michigan

FOR FASTER GRINDING & POLISHING



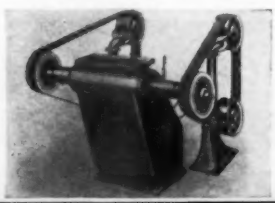
The New
JONES BACKSTAND IDLER NO. 120

CONVERTS YOUR LATHE TO FAST, SMOOTH, EVEN ABRASIVE BELT GRINDING

Ideal for crowded grinding and polishing departments, the Jones Abrasive Belt Backstand Idler No. 120 takes a minimum of floor space to convert your present lathe to fast, uniform, low-cost abrasive belt grinding.

- Uses Minimum Floor Space
- Conveniently Located Controls
- High Speed—Fast Production
- Easy to set up

Note the simple arrangement at right, using a regular lathe and two Jones Backstands. *Bulletin No. 120* gives complete details.



JONES ENGINEERING COMPANY
DEPT. A-1, ELLWOOD CITY, PENNSYLVANIA

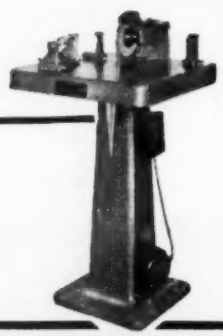
ABRASIVE SURFACE GRINDERS

No. 34 (VERTICAL SPINDLE)

Get acquainted with the complete line of Abrasive Grinding Machines.

Information available in Sweet's Catalog, from nearest dealer or home office.

ABRASIVE MACHINE TOOL COMPANY
EAST PROVIDENCE RHODE ISLAND



FASTER, MORE ACCURATE CUTTER GRINDING ASSURED with the "BARNES"

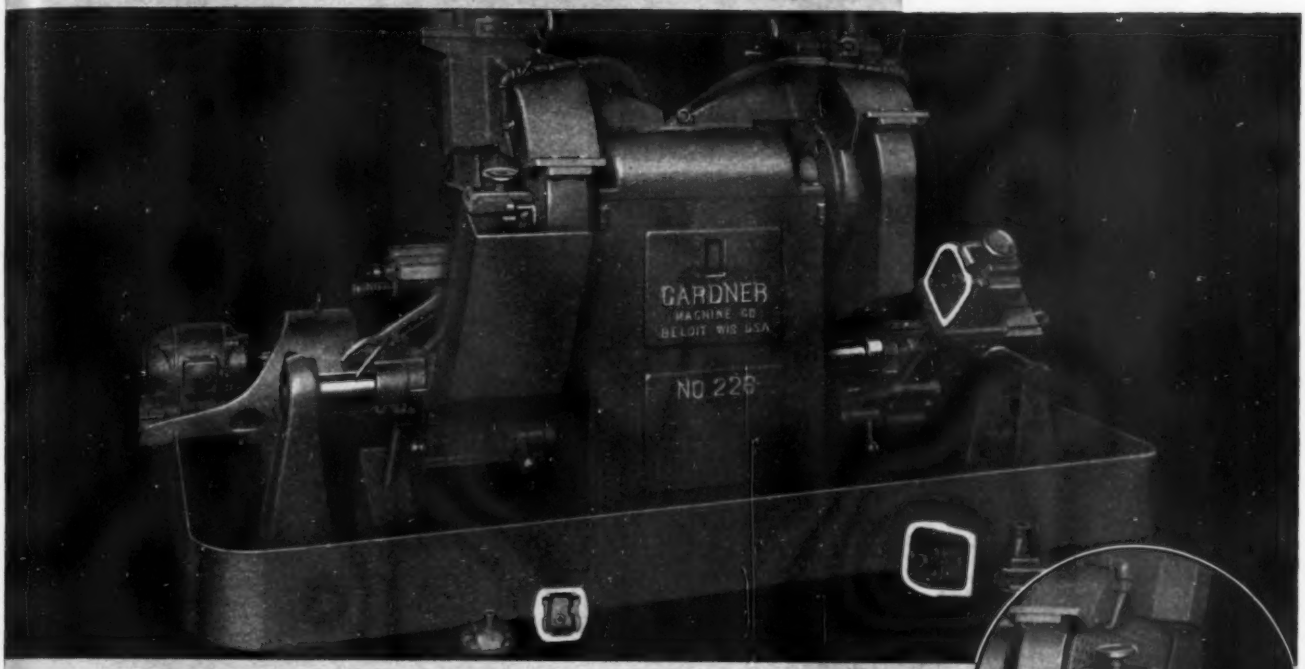
The Barnes Precision Cutter Grinder will grind formed cutters faster and preserve form absolutely. Cutter life is extended five to eight times over ordinary methods.

Utility and speed of the "Barnes" extends to the grinding of all types of cutters regardless of profile without changing existing cutter equipment. Form relieved cutters, sharpened on this machine become profile cutters. No high degree of skill is required to grind even the most complicated or irregular formed cutter.

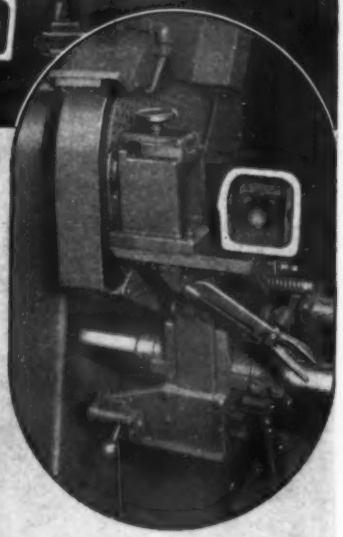
Send for Descriptive Circular

GENERAL MACHINERY CORP.
140 Federal St. Boston, Mass.

Cut out "*fatigue-lag*"



with these *power-operated* work tables!



THE lag in production experienced in the late hours of the shift, on any purely hand-operated machine, is eliminated on Gardner Single-Spindle Disc Grinders with the use of Mechanically-Oscillated Work Tables.

Here is a No. 226-26" machine equipped with 2 such tables, which make it possible for an operator to merely load and unload the fixtures. One operator is, however, required for each end of the grinder.

The job shown is transmission covers, in 2 sizes, as seen in the foreground. The smaller size is ground at the rate of 60 to 70 per hour, and the larger size, at 75 to 85 per hour. They are held within .004" to .006" for flatness.

Now, when production must be held at high levels, plan to cut out "fatigue-lag" with a Power-operated GARDNER GRINDER!

WRITE FOR BULLETIN 200B

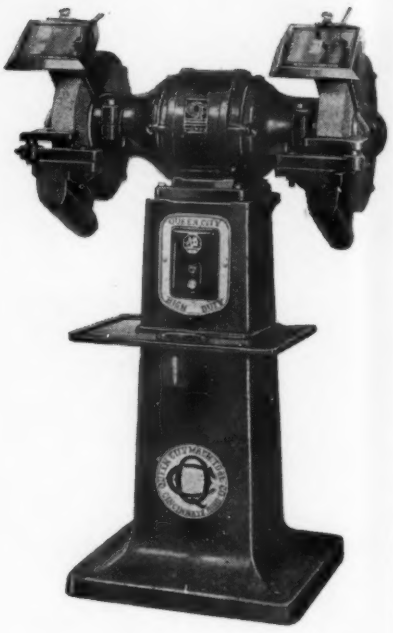
GARDNER - GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

410 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.

QUEEN CITY GRINDERS

Powerful..Sturdy..Efficient



• Queen City Grinders are powerful—built in a complete range of sizes in bench, pedestal and heavy duty box type bases in units from 1 H.P. to 10 H.P. Each unit is equipped with two Carborundum wheels—one coarse, one fine . . . safe enclosed wheel guards with built in exhaust . . . Allen Bradley push button switch with overload protection . . . adjustable and safe work rests . . . tool tray . . . water pot . . . adjustable, shatter proof, clear glass eyeshields.

All Queen City Grinders come fully equipped with grinding wheels, ready for immediate use. Initial cost is well under that of comparative grinders.

These QUEEN CITY DEALERS are at Your Service

Geo. M. Bernstein & Co.	Chicago, Ill.
Indianapolis Machinery & Supply Co.	Indianapolis, Ind.
James W. George Machinery Co.	Detroit, Mich.
Eichman Machinery Co.	Kansas City, Mo.
McDonald Machinery Co.	St. Louis, Mo.
Cincinnati Machinery & Supply Co.	Cincinnati, O.
Hess-Schneck Co.	Cleveland, O.
E. W. Smith Machinery Co.	Dayton, O.
Elyria Belting & Machinery Co.	Elyria, O.
State Machine Tool Co.	Milwaukee, Wis.
C. H. Gosiger Machinery Co.	Dayton, O.

QUEEN CITY MACHINE TOOL CO., 218 East Second St., Cincinnati, Ohio

---

FLATNESS and SMOOTHNESS
of Production Parts
The Ultra-Lap machine will finish your parts to a flatness of one light band or less . . . to a smoothness as low as one micro-inch R.M.S., any metal or material. Much faster, more uniform than hand method. Machine designed for you or we shall be pleased to lap your parts on a job basis. Ultra-Lap machines and service used by aircraft and many other war-time industries.
Ultra-Lap MACHINE COMPANY
207 McDOUGALL AVE. • DETROIT, MICH.

GREENFIELD No. 4

TOOL AND CUTTER GRINDER

Convenient and accurate with capacity for heavy work

Write for detailed information and complete specifications.

Ideal for shop or tool room, this machine (available as a Plain Cutter and Reamer Grinder or a Universal type) offers sturdiness in construction and long life under hard service.

A large heavy head is used and wheel rigidity assured by a tie bar.

A sturdy spindle having all surfaces ground concentric runs in scraped-to-fit bronze bearings.

Standard is integral with base and extra broad knee splined to standard. Sleeve of elevating hand wheel is graduated in thousandths.

Cylindrical and Internal Grinding Attachments as well as a 4" Universal Scroll Chuck are furnished when the machine is supplied as a Universal type. (4U)

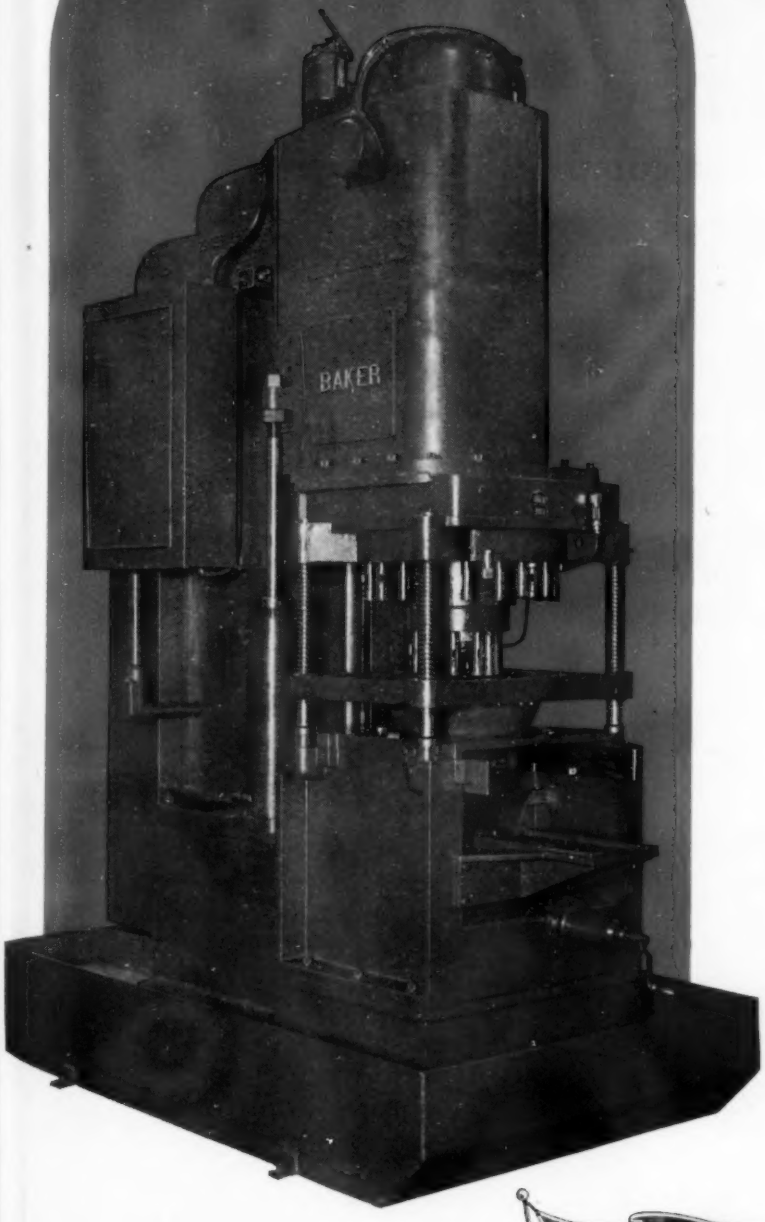
Capacity of Cylindrical Grinding Attachment 4" dia. by 15" long
Capacity of Internal Grinding Attachment—up to 4" dia.
Swing on table #4 and #4U—8½"
Speed—main spindle 2900 and 4200 RPM.
Speed—internal spindle 13,000 RPM.
Floor space—40" x 60"

PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

BAKER



MODEL 36-HO

Tooled for production!

PARTS HANDLED—This BAKER Model 36-HO was furnished by BAKER BROS., INC., for drilling 30 holes in crankcase front sections as being made by a well known aircraft engine builder.

EQUIPMENT—The machine is furnished completely tooled . . . is arranged with a 30 spindle fixed multiple head. All spindles of this multiple head are mounted on ball bearings. Spindle ends have vertical adjustment sleeves for maintaining relation of length of tools.

SPECIAL FEATURES—The tool support bushing plate for support of drills carried from multiple head and piloting over the work-holding fixture is of special design by the BAKER BROS. Engineering Department. The machine is equipped with the BAKER twin-pull cylinder application with fully automatic cycle. In the interest of speed and flexibility, the head mounted on the feeding saddle is arranged in the gear train with provision for pick-off speed change gears. This gives the machine various speeds to the main drive of spindle.

While giving production far in excess of previous output, this BAKER Model 36-HO sacrifices none of the accuracy and precision required by the aircraft industry. Designed to reduce chucking and handling time, the 36-HO is both efficient and versatile . . . can be relied on for continuous three-shift production with a high degree of accuracy. Flexibility is keynoted . . . the machine can be readily retooled for operations after the Emergency. Demands for better shop appearance were anticipated . . . and to this end the BAKER 36-HO offers a clean design with all major units enclosed, yet easily accessible.

To speed production—to lower costs—consult BAKER about your drilling, boring and tapping problems *today*. There is a BAKER unit to meet your specific needs. Write, wire or phone . . . complete information will be sent immediately.

BAKER BROTHERS, INC. • Toledo, Ohio, U.S.A.

Our Motto Since 1867:
"Machines Sturdy and Efficient, as Fine as Can Be Built..."

DRILLING
BORING
TAPPING

Vitrified Wheels

To familiarize you with the complete VITRIFIED LINE . . . . .

All the advantages of economy, long life, accuracy and low cost production are available through standardization on Vitrified Grinding Wheels which are available for every kind of grinding job.

The Vitrified Line includes:

BORITE—for grinding steel of all kinds

CARBORITE — for cast iron, bronze brass and aluminum

SILICATE BONDED—for grinding steel to a fine edge and also for surface grinding

SHELLAC BONDED — for high finish, and also in very thin sizes

RESINOID BONDED — for high speed service in snagding steel and malleable castings, etc., and also for cutting off

Our representative will gladly recommend the wheel best suited to your grinding requirements. Full details of the Vitrified Line are available in our catalog.. Ask for it.

VITRIFIED

VITRIFIED WHEEL COMPANY

WESTFIELD MASS.

Heat-toughened to withstand long, hard usage, close-fitting parts of your shop machinery fall easy prey to an attacking stream of abrasive projectiles from the wheels of grinders and buffers. Just as defenseless are the lungs of even your most rugged workers.

Trap these atomic "Fifth Columnists" at their source. Get the easy-to-install, easy-to-clean Cincinnati Air Master. Three sizes to assure proper fit. Write today for descriptive bulletin.

The Cincinnati

ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

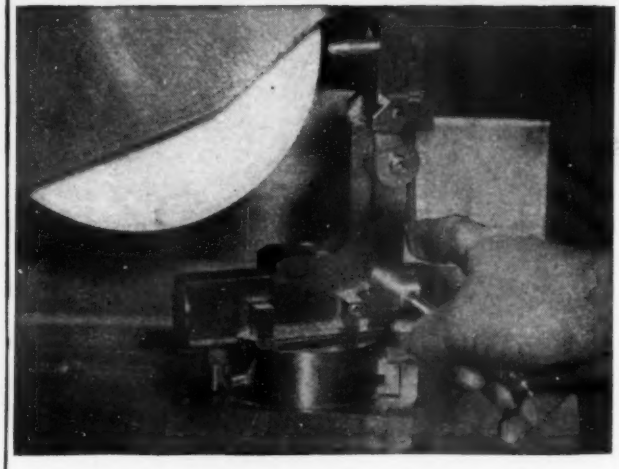
The Cincinnati Electrical Tool Co.

DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

2676 MADISON RD

A RADII & ANGLE DRESSER

OF PRECISION AND VERSATILITY



An instrument of precision and versatility . . . Operation is simple requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

One angle
Two angles
Concave radii up to 6"
Convex radii up to 4½"
Two angles and radius.
Many other diversified forms to meet requirements.

Wheel size capacity—9" dia.; angular travel 3"; for use on universal surface and cylindrical grinders.

Full details available on request.

MANUFACTURED BY

J. & S. TOOL CO. 477 MAIN ST. EAST ORANGE, N. J.

PRECISION DRESSING TOOLS

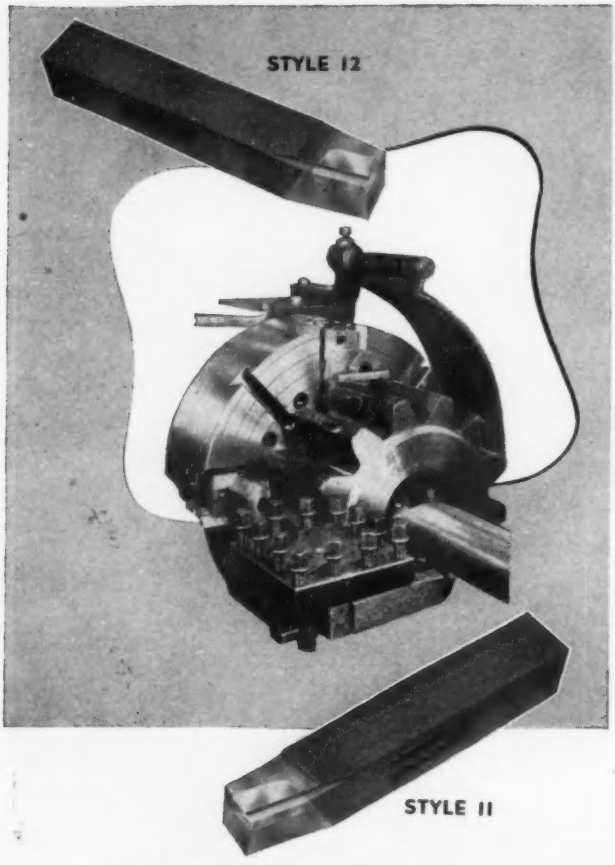
YOU PROBABLY remember the huge number of bombers you lost over England a while back, don't you? And most of them from those -‡$%&@*" @&*$%‡" ACK-ACK guns, too!

Well, confidentially, Schicklgruber, though we can't tell you much (these guys keep things so darned secret around here), we can inform you that we had a little part (not much, mind you, but a little) to play in that show.

Above is a photo (sorry it's been painted out so much) of a [redacted] that we had something to do with, and that had something to do with something that had something to do with the losses you had over England. Remember?

Now, Schicklgruber, this is strictly confidential, and we don't want you to tell it to a soul, except maybe a few of our customers. We may be able to fix up something as accurate for them some day.

VINCO CORPORATION
8851 SCHAEFER HIGHWAY, DETROIT, MICHIGAN



KENNAMETAL*
THE TOOL THAT *can take it!*

Operations that include such obstacles as interrupted cuts and machining high Brinell steels require a tool "that can take it".

KENNAMETAL'S superior Rockwell C hardness of 77.6, and Rockwell A of 90.8, enable it to cut steels up to 550 Brinell efficiently for longer periods of time between regrinds. The high transverse rupture strength of KENNAMETAL tools permits them to take interrupted cuts without the danger of tool breakage. These features have given KENNAMETAL steel-cutting carbide tools a reputation for hardness and strength unsurpassed in the carbide tool field.

If your production is curtailed by tool breakage and tool wear, use KENNAMETAL.

Write for your KENNAMETAL Tool Manual today. It contains information on selection, care, and handling of carbide tools.

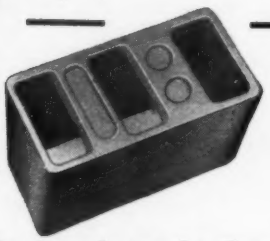
KENNAMETAL THE All American CARBIDE

* Invented and Manufactured in U. S. A.

McKENNA METALS Co.
103 LLOYD AVE., LATROBE, PA.
Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Exclusive of Canada and Great Britain

Why Waste *Surfacing* Time?

THIS NEW
PORTER-CABLE G-8 SURFACER
Does it in
1/10TH THE TIME
• • • Freehand!



• This manganese box —3" x 6", with a 3/16" wall, had to be machined absolutely flat top and bottom to close limits. Milling could only hold it to +.002, —.003 variation from the true flat. Freehand surfacing on the G-8 Porter-Cable machine holds it to +.001, —.001 variation!—and nine boxes to one are now being turned out.

• • •

Versatile Porter-Cable Wet-Dry Belt Surfacers can do many a job faster and better than ordinary millers, shapers and grinders. Examples in actual production show speed-ups ranging from *5 to 50 times faster!* As to precision, tolerances of .0005" are held with the aid of simple fixtures.

Wet-Dry Belt Surfacing works equally well with hard or soft metal, plastics, glass, fibre and compositions. High-Speed abrasive belt produces even, true, fine-finished surfaces, either flat or curved. Used *wet*, it eliminates heating, warping, discoloring and dust . . . safely handles inflammables.

Shift to the Porter-Cable Wet-Belt Surfacing! Send now for our free new booklet—it will show you startling new applications *you* can use in your war-production!

Unskilled Workers Find Belt Surfacing Easy and Safe!

Porter-Cable Model G-4 (right) releases your skilled men for more intricate jobs . . . gets high production from women and untrained personnel. Simplicity and adaptability make it perfect for second operations.

PORTER-CABLE MACHINE COMPANY
1725-5 N. Salina St. Syracuse, N. Y.

TAKE THE LOAD OFF

THE ENDS OF GEAR TEETH

"End bearing," a concentration of stress on one end of gear teeth, always seriously limits the useful life of the gear and impairs its operation while in service.

You can eliminate end bearing troubles by shaving gear teeth to the ELLIPTOID form. This produces a tooth thicker in the central section than at the ends. The difference in T.T. is usually .0003" to .0005" per inch of face width on each side of the tooth. The amount of crown can be varied to compensate for errors encountered in assembly and because of heat treat distortion. And it takes no more work, no more machine time or cost to produce the ELLIPTOID tooth form than it does the conventional tooth.

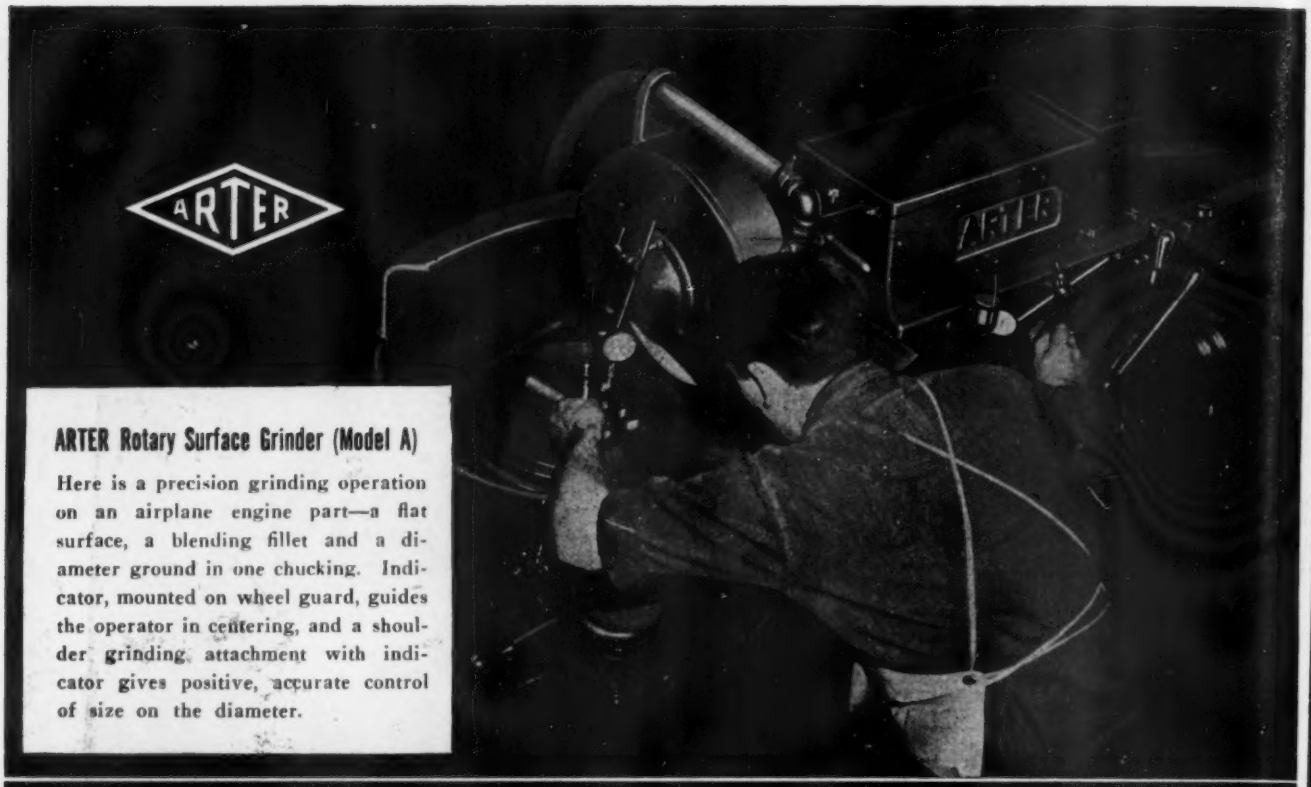
If the gear is to be lapped as a final operation, the ELLIPTOID form materially reduces lapping time. In fact, the lapping time on an ELLIPTOID tooth gear is only about one-third that of a comparable gear with conventional tooth form.

Send for *descriptive bulletin on RED RING Gear Shaving and the ELLIPTOID Tooth Form.*

NATIONAL BROACH AND MACHINE CO.
RED RING PRODUCTS
5600 ST. JEAN · DETROIT, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS



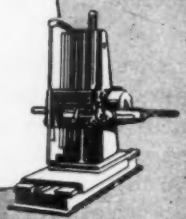
ARTER Rotary Surface Grinder (Model A)

Here is a precision grinding operation on an airplane engine part—a flat surface, a blending fillet and a diameter ground in one chucking. Indicator, mounted on wheel guard, guides the operator in centering, and a shoulder grinding attachment with indicator gives positive, accurate control of size on the diameter.

ARTER GRINDING MACHINE COMPANY
WORCESTER, MASSACHUSETTS • U. S. A.

GILBERT

PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

HOLMAN BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

Avey Sensitive DRILLING MACHINES
CINCINNATI OHIO

CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

NEW!

CLECO RIV-N-JECTORS CUT RIVET LOSSES 90%

Riv-N-Jector is held in the left hand —rivet hammer in the right, as usual. In driving, left hand can steady the tool, insuring accurate work. ▶

The cost of reclaiming rivets which have been dropped or mixed in stock varies from 75% to 125% of the original purchase price. Out of 3 rivets issued to the operator, often only 1 is driven home, while the other 2 are wasted.

Cleco Riv-N-Jectors (patent pending) afford the perfect solution to this costly, wasteful problem. The Riv-N-Jector has a magazine holding about 50 rivets, which can be released one at a time into the rivet hole. Slight pressure of the fingers releases the rivet, while another rivet feeds down for insertion in the next hole. Riv-N-Jectors are easily loaded by a hopper-loader.

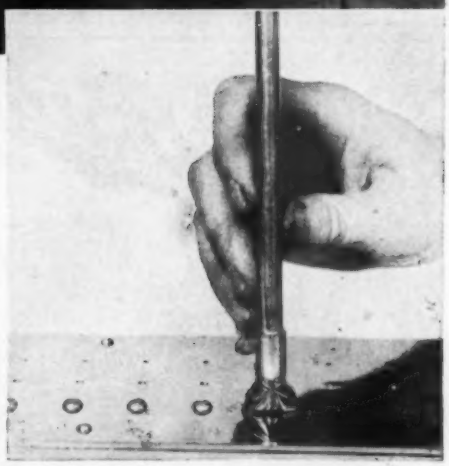
RIV-N-JECTOR ADVANTAGES

Less Waste—Using a Riv-N-Jector, the operator only loses 2 or 3 rivets out of 50, compared with loss of more than half when handled by hand—*a 90% saving!*

Greater Speed—With Riv-N-Jectors, operators often insert and drive 30 rivets per minute.

Easy Operation—Operators learn to use Riv-N-Jectors practically at a glance; at the end of the day they are experts.

No one engaged in airplane fabrication can afford to be without this remarkable device. For complete information, write for Bulletin 89.



Inserting a rivet with the Riv-N-Jector.

The Riv-N-Jector is feather-light, easy to handle.

BUY U. S. WAR BONDS AND STAMPS

THE CLEVELAND PNEUMATIC TOOL COMPANY

Branch Offices in All Principal Cities ★ CLEVELAND, OHIO

CARD
MACHINE SCREW
TAPS

CARBON AND HIGH SPEED STEEL

The CARD Quality

PROVE THEIR PERFORMANCE ON YOUR WORK

CARD MACHINE SCREW TAPS are furnished with American National form of thread and standard number of flutes in taper, plug or bottoming style.

Regular Type manufactured in 2, 3 or 4 flutes depending on size—in taper plug or bottoming styles.

Spiral Pointed furnished in 2 flutes—in plug style only.

All types available in Carbon, High Speed cut and High Speed Ground Thread.

The long life and economy of Card Machine Screw Taps are quickly proved in every day use. Buy them, put them to work and you'll be convinced of their better performance.

Consult the Card Catalog for sizes. Send for your copy as well as for literature covering recommended uses.

LEADING DEALERS HANDLE CARD TAPS

S. W. CARD MANUFACTURING CO.

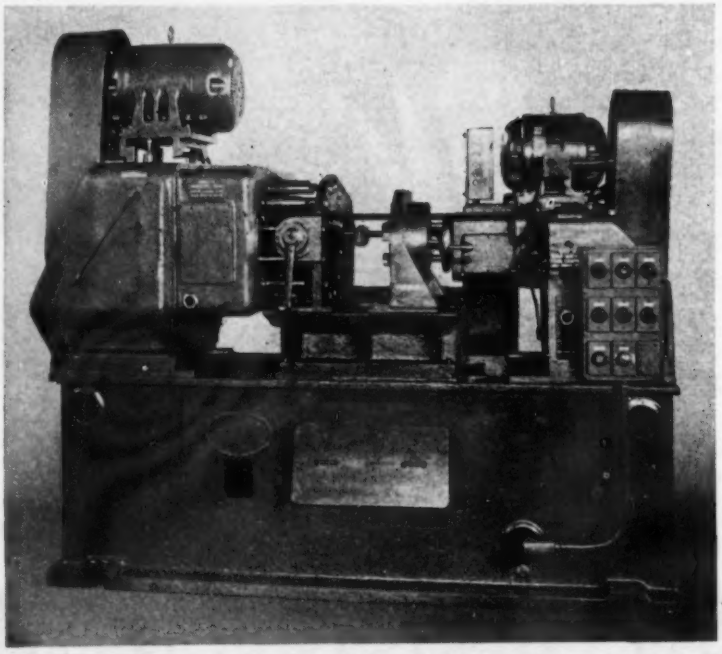
Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO.

STORES: New York: 61 Reade St., Chicago: 11 S. Clinton St., Detroit: 6540 Antoine St., San Francisco: 121 Second St., Seattle: 568 First Avenue, South
Los Angeles: 524 East Fourth Street

Let Buhr PATENT

MULTIPLE SPINDLE
DRILL AND TAP HEADS

put your idle machines on the production line



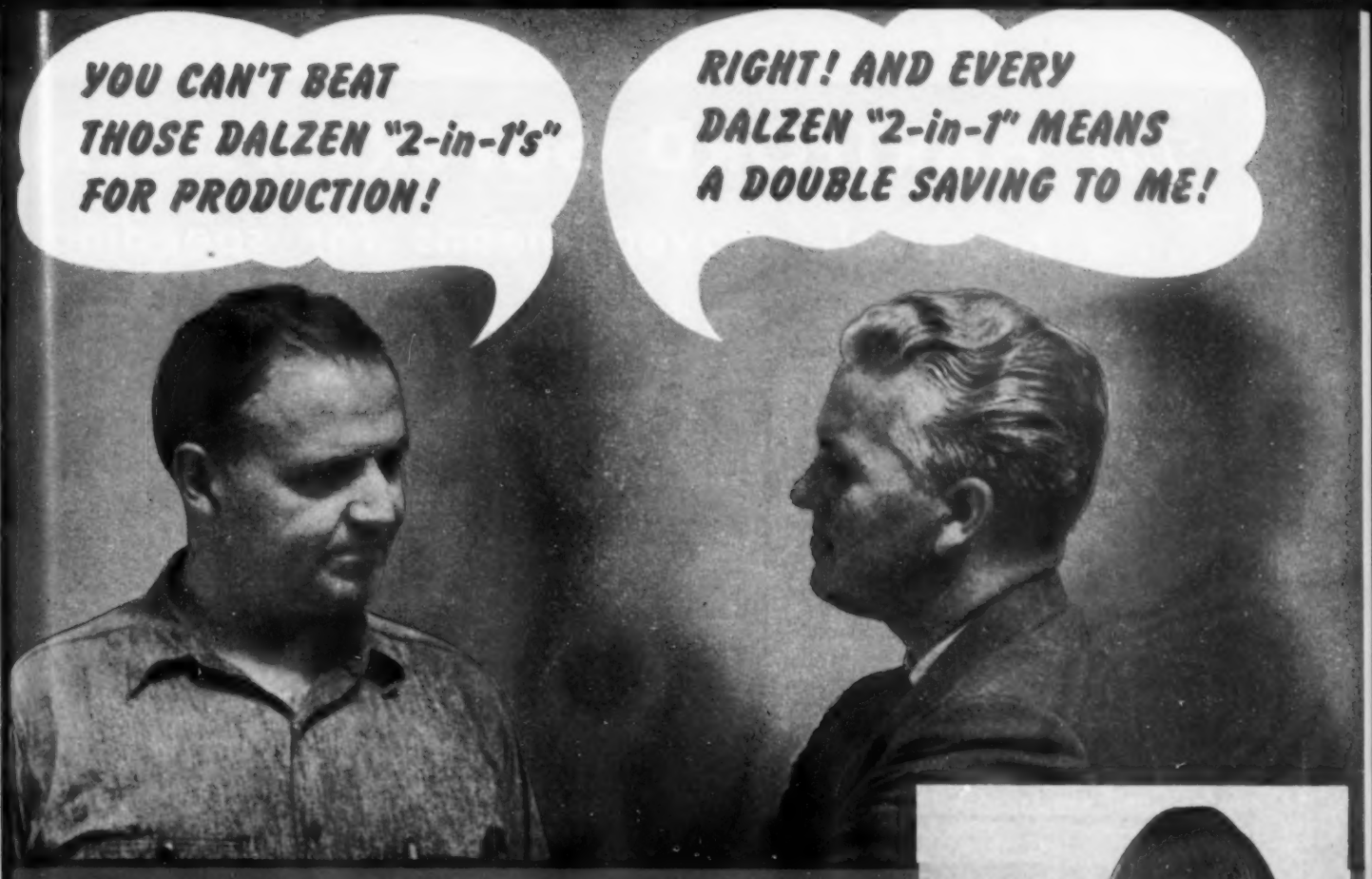
A base and motors brought out of storage and retooled with a holding fixture;

A 19-Spindle Tapping Head on Left Side and an 8-Spindle Tapping Head on Right Side.

All spindles are provided with vertical adjustment to secure proper tap depth, and each head has an oil pump for positive lubrication and freedom from wear.

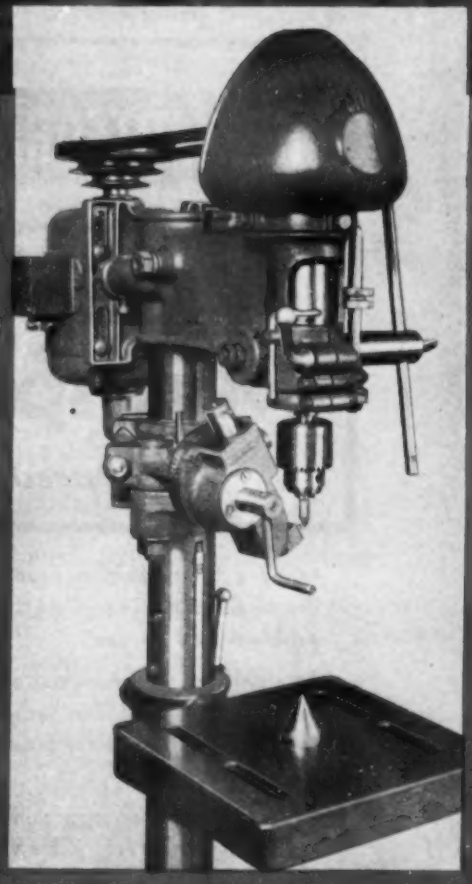
BUHR MACHINE TOOL COMPANY, ANN ARBOR, MICH.

Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment



• The Dalzen "2-in-1"—combination center grinder and drill press—is priced sensibly, about half what you'd expect to pay elsewhere. Up-to-the-minute methods of manufacture, in Dalzen's modern plant, effect real savings in cost — savings that are passed along to you.

You save doubly because these same manufacturing methods give you a better machine, built for years of dependable service on a wide variety of work. Easy, rapid adjustment permits use as a center grinder or drill press at a moment's notice. Four-speed, V-belt drive will handle any type of work. Furnished complete with motor, diamond, and lapping stone. Prices and specifications rushed on receipt of letter, wire, or telephone call.



DALZEN
TOOL & MANUFACTURING CO.
12255 EAST 8 MILE ROAD • DETROIT

A DALZEN *WILL DO IT!*

Dalzen tools — taps, flat and round broaches, thread milling hobs — have the same high reputation for accuracy and dependability as Dalzen Thread Grinders and Center Lapping Machines. Sturdy, compact, efficient, Dalzen machine tools give maximum production per cubic foot, per pound, per dollar of cost! Write for descriptive literature.

DALZEN IN AIRCRAFT

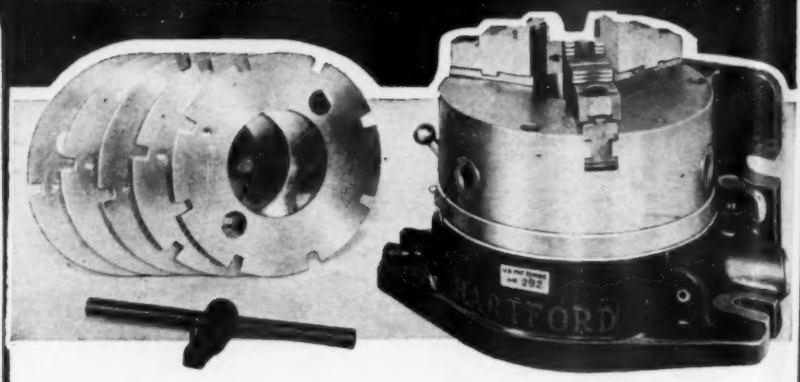
Ground thread parts are being produced on contract for leading aircraft engine manufacturers. For detailed data on this service, submit blueprints and specifications when making inquiry.

The HARTFORD SUPER-SPACER

. . . a practical, proved means for speeding indexing work and maintaining accuracy

No special skill is required to operate this sturdy, fool-proof, widely used indexing device. Any machine operater can handle indexing operations with speed, efficiency and accuracy because all chance of error is eliminated by the use of mask plates.

Applicable to milling, drilling, slotting, grinding, jig boring and planing operations, for use in a horizontal or vertical position, the HARTFORD SUPER-SPACER is a versatile means of speeding production on a wide range of work. Its utility is not limited to mass production only because it can be used to great advantage also on single piece work.



Write for illustrated bulletin showing a few of the wide variety of jobs that are being handled effectively and faster with the HARTFORD SUPER-SPACER.

THE HARTFORD SPECIAL MACHINERY CO. HARTFORD, CONN.

Heavy Duty Multiple Drilling

Speeds Production

HD-68 DRILLER

Many a tough drilling problem has been solved by the use of these rugged, rigid and powerful machines. Your problem may be next.

Straight line or special out of line drilling can be done to advantage with Moline hydraulic feed drillers. Easily adjustable spindle centers provide maximum adaptability to different jobs.

The HD-68 has an approximate capacity of fifteen 1¼-inch drills in steel. This machine is furnished in five standard sizes ranging from 6 feet to 20 feet in length.

BORING — HONING — DRILLING — TAPPING — SPECIAL MACHINERY

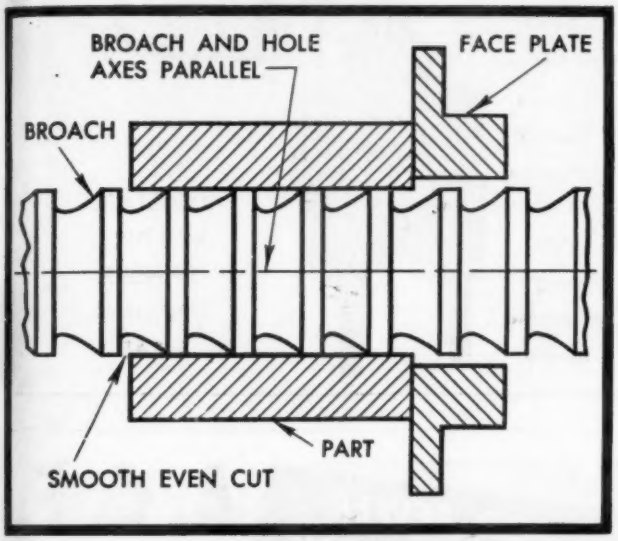
MOLINE TOOL COMPANY

MOLINE, ILLINOIS **"HOLEHOG"** **ESTABLISHED**

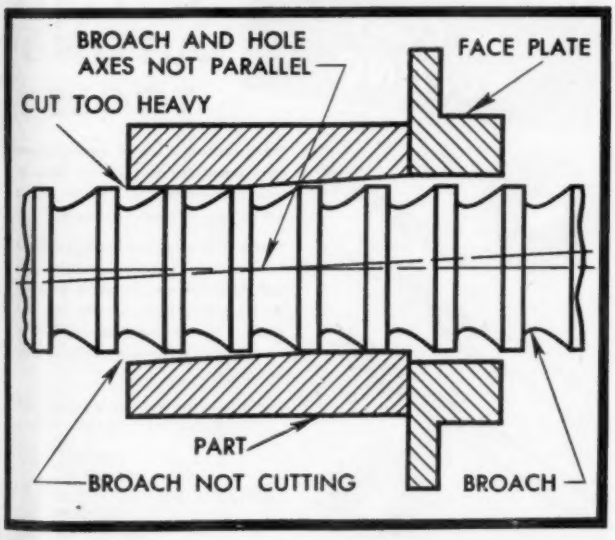
To Assure Maximum Broaching Efficiency

Be Sure PART HAS BEEN PREPARED CORRECTLY

CORRECT



INCORRECT



When broaching round holes it is very important that the axis of the broach be in perfect alignment with the axis of the hole being broached. This insures an even cut all around the circumference and an even stress on the broach.

The most important requirement in securing this condition is to have the hole square with the locating face. If the hole is not square strains will be set up which may cause breakage of the tool, or force it to cut too heavily on one side, and too lightly on the other, resulting in a hole not completely "cleaned up".

In those cases where squareness of the hole is not possible self-aligning face plate should be used. This will be described in a subsequent advertisement.

COMPLETE BROACH SERVICE

ARMY (E) NAVY

DETROIT BROACH COMPANY

20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

NOW quickly Available... SUPER *Carbide-Tipped* STANDARD MILLING CUTTERS!

No longer is it necessary to limit the use of tungsten carbide-tipped milling cutters only to long run jobs on which the cost of expensive tools could be profitably absorbed. Super Tool Company's new design of standard side and face mills with cast alloy bodies and the minimum number of flutes reduces the cost of carbide-tipped milling cutters and extends their practical use to short runs and general shop tooling.

FASTER MILLING . . . GREATER ACCURACY

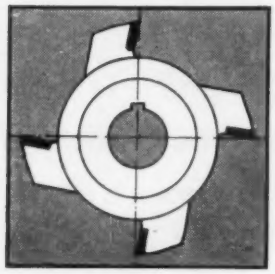


Figure 1
For cast iron, non-ferrous and other materials

These new type cutters provide the important advantages long associated with carbide-tipped tools. One advantage is faster milling. The higher cutting speeds at which it is possible to operate the carbide-tipped cutter lead to increased table feeds, despite the reduction of feed per tooth per revolution. Greater accuracy is also attained at the higher operating speeds. The feed per tooth being lower, the cutting pressure is lessened and consequently there is less distortion of the work. Many jobs are now being run successfully in steel at surface speeds of 400 to 800 feet per minute with tooth load varying from .0005" to .0025" with the hardness of the steel.

STANDARD CUTTERS FOR ALL MATERIALS

Standard cutters for cast iron, brass, bronze, copper, aluminum, magnesium, plastics, etc., are supplied promptly from stock in diameters from 3" to 6", in a variety of widths, and with 4 or 6 flutes. (See Fig. 1). For cutting steel, these sizes have 6 to 12 flutes, according to diameter. (See Fig. 2).

★ ★ ★

Send now for folder showing specifications, prices, etc. See how you can lower your milling costs with carbide-tipped milling efficiency.

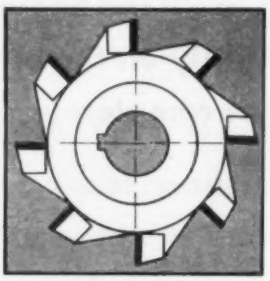


Figure 2
For steel cutting

SUPER TOOL CO.
Carbide Tipped Tools
21650 Hoover Road Detroit, Michigan

ERRINGTON
STAPLETON, STATEN ISLAND, N. Y.
MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads
Fixed-Center Auto-Reverse Multiple Tapping Heads
All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles
ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

A. C. E.
SPECIAL CUTTING TOOLS

Many nationally known defense plants have stated that they did not have to return, as defective, any of the special cutting tools they ordered from us.

They further commented that they suffered few interruptions in their operators' work and obtained a long useful life from our special cutting tools, because of their accuracy and fine workmanship. Let us quote on your next cutting tools, especially round work.

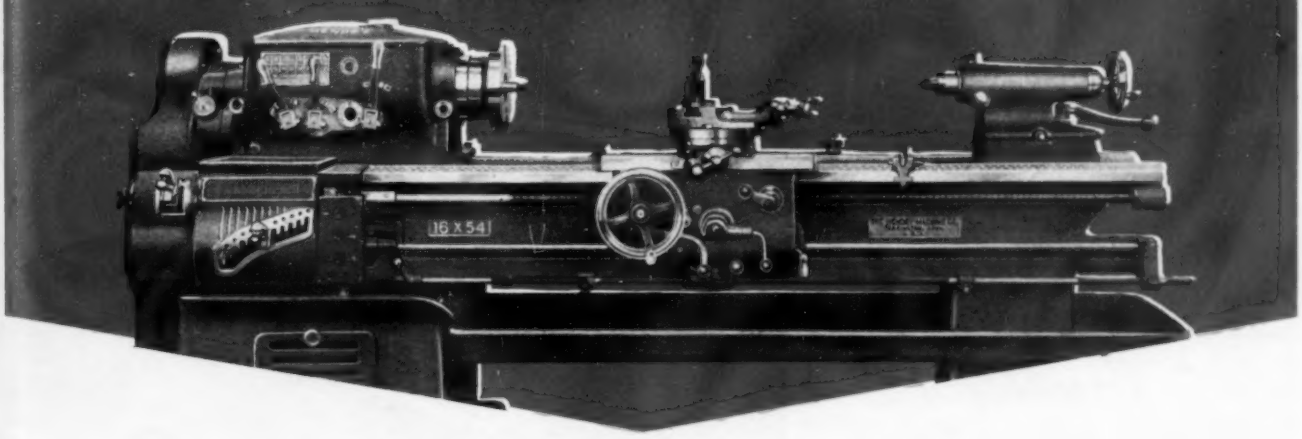
AMERICAN CUTTER AND ENGINEERING CORP.
31745 MOUND ROAD, WARREN, MICH.

BULLETIN 201 FREE ON REQUEST

AMERICAN CUTTER
AND ENGINEERING CORP., WARREN, MICH.
SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

HENDEY

12 SPEED GEARED-HEAD LATHES



for PRECISION PRODUCTION

★

★

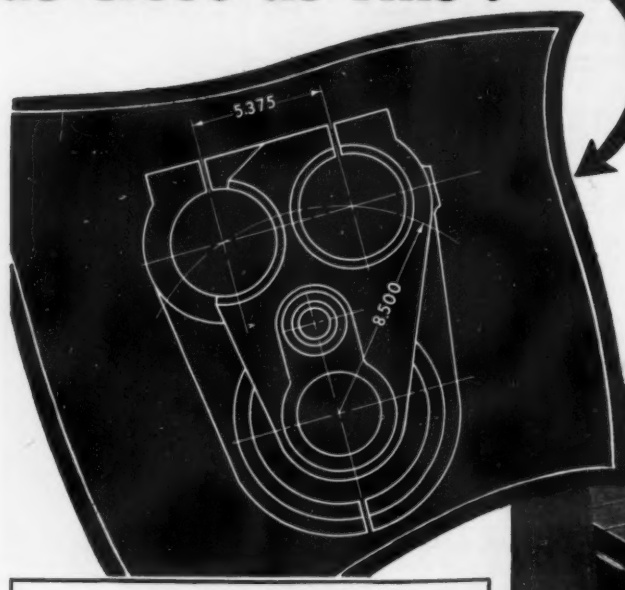
★

Every variety of work that can be done on an engine lathe can be conveniently handled on these modern, fast machines, built in 12"-14" and 16" sizes. They are equally well suited to production or tool room requirements. Every detail has been developed to assure long-lived accuracy.

THE HENDEY MACHINE COMPANY

TORRINGTON, CONN. U. S. A.

Can You Hold Bore Locations as Close as This?

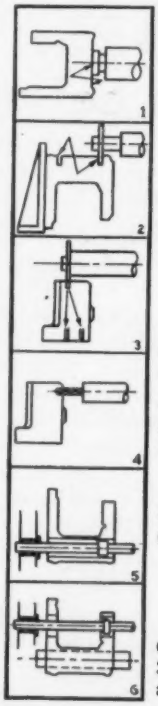


(Right) Operation 6 as it appears on machine.

Versatility:

FOR PROPER MACHINING SEQUENCE

Proper machining sequence is available through ample feeds and speeds and versatility of G & L Machines. The operations sequence on the arbor support, as performed on the G & L, is shown below.



1st Setting

OPERATION 1—Mill for locating purposes.

2nd Setting

OPERATION 2—Place on angle plate. Saw two 1/8" slots—with table feed.

3rd Setting

Same as 1st Setting, but turned 90°.

OPERATION 3— Saw three 1/8" slots—saw with head feed.

OPERATION 4—Drill *and Tap* three stud holes 25/32 drill—3/4–10 tap.

4th Setting

Place on Top Milled Surface.

OPERATION 5—Bore 2 holes.

5th Setting

Place part on dummy overarms.

OPERATION 6—Bore 2 holes. See machine illustration above.

Operations Performed on G&L include:

BORING, DRILLING, MILLING, SAWING *and Tapping*

This prominent manufacturer of machine tools uses his G & L Horizontal Boring, Drilling and Milling Machine for short run boring operations requiring extreme accuracy. On this arbor support the locations of the bores are held to exact drawing dimensions. It is a special support designed to fit a machine already in service. Each of the bores is cut with a saw for clamping purposes, and the part had to be bored so that when attached to the machine in the customer's plant the accuracy would be maintained.

G & L machines are being used for an endless variety of machining operations on both small and large parts in many industries. With G & L attachments and accessories there is practically no combination of operations that cannot be performed with great speed and economy. Feeds and speed ranges cover all metals, and practically any cutting requirements.

G & L engineers will be glad to make recommendations for faster machining of your work on G & L equipment. They are at your service.

GIDDINGS & LEWIS MACHINE TOOL COMPANY

138 DOTY ST., FOND DU LAC, WISCONSIN

FREE DATA *Information covering the complete line of G & L machines and time-saving attachments and accessories is included in this catalog. Write for your copy. Ask for Catalog No. 52.*

GEOMETRIC Pointers

FOR SAVING HIGH SPEED STEEL

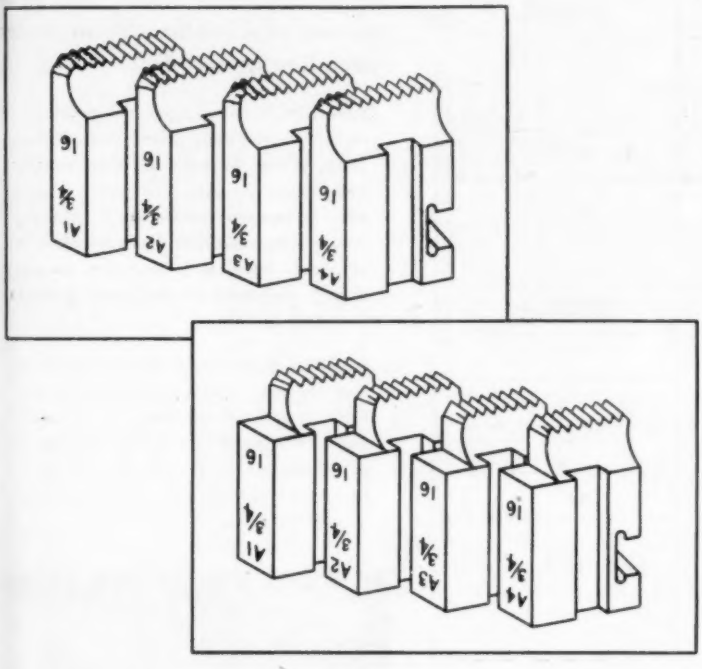
No. 5

SALVAGE ALL WORN-OUT CHASERS

HIGH SPEED STEEL IS PRECIOUS!

High speed steel is hard to get. Don't waste it! Buy only the chasers you require and keep them on the job until they have "given their all" in thread production. Many times, chasers with worn out or chipped teeth can be salvaged by recessing the front face as shown in the illustration.

But prevention is better than salvage. Don't let your chasers run into a shoulder and break. Resharpen them regularly before they become dull or start to turn out inaccurate threads. And finally when they will no longer cut passable threads, don't put them in with the general scrap. Segregate all high speed scrap and return it to the mills or dealers that specialize in high speed steel. The Geometric Tool Company, New Haven, Connecticut.



Above is shown how a set of chasers with worn or chipped teeth (top illustration) can be recessed and made serviceable for many more jobs of thread production. After recessing the chasers must be rechamfered and, if the entire cutting face is dull, it should be touched up slightly, removing only .002" or .003".

The Geometric Tool Company is listed on the Treasury Department's Roll of Honor of those companies which contribute at least 10% of their gross payroll for War Bonds. Buy War Bonds and Stamps each payday! Our soldiers, sailors and marines are GIVING their lives. Surely you can LEND your money!

GEOMETRIC

SELF-OPENING DIE HEADS
COLLAPSING TAPS
CHASER GRINDING MACHINES

SOLID ADJUSTABLE DIE HEADS
SOLID ADJUSTABLE TAPS
THREADING MACHINES

FLEXPEDITE

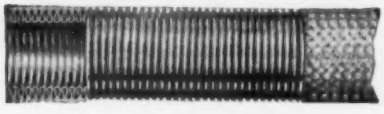
Your Conversion—Assembly—Production

with

REX-WELD

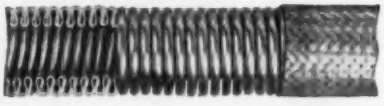
Flexible Metal Hose

Rex-Weld Hose—Annular Corrugations



RW-80 Unbraided ——— RW-81 Braided

Rex-Weld Hose—Helical Corrugations



RW-90 Unbraided ——— RW-91 Braided

General Data

	STEEL	BRONZE
Sizes	To 4" I.D.	To 4" I.D.
Pressures	To 14,500 p.s.i.	To 14,500 p.s.i.
Temperatures	To 1000° F	To 450° F.
Lengths	To 50′	To 50′

Use Chart

	*STEEL	BRONZE
Saturated Steam		✓
Superheated Steam	✓	
Sulphur Bearing Oil	✓	
Oxygen		✓
Ammonia	✓	
Carbon Dioxide	✓	
Sulphur Bearing Grease	✓	
Critical Vibration		✓
Non-Sparking		✓

Protective Coatings Can Be Applied for Corrosion Protection (To Conserve Critical Copper Bearing Alloys).

Couplings: REX-TITE Mechanical (Re-attachable) Couplings; Solder Couplings; Brazed and Welded Couplings and Flange Assemblies for Rex-Weld Flexible Metal Hose.

Ask for Engineering Recommendations

CHICAGO METAL HOSE CORPORATION

General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Ill.

Hundreds of accidents, thousands of lost production-hours, millions of unnecessary expense-dollars have been ended by a new, magic carpet for industrial plants — Speedi-Dri. Your plant can now end the menace of greasy floors — while you save the cost of scrubbing them — by spreading Speedi-Dri.

Speedi-Dri is a fire-proof, skid-proof absorbent for removing grease and oil from floors. It literally pulls oil discolorations from wood, concrete, and steel. It provides a non-slip surface as it does so. It is a non-combustible fire-resistant. It is absolutely harmless to personnel or machinery, brightens up the plant, is easy to sweep up.

Join the leading war-production plants of America in spreading Speedi-Dri on oily floors to prevent accidents, remove fear, and retard fire. Where there's also water, or soluble oils are found, use Sol-Speedi-Dri. Prompt service from warehouse stocks in leading cities.

Ask for demonstration or write for a generous free sample of Speedi-Dri.

SPEEDI-DRI
OIL AND GREASE ABSORBENT

SUPPLIERS

East — REFINERS LUBRICATING CO.
New York City

Midwest and South
WAVERLY PETROLEUM PRODUCTS CO.
Philadelphia, Pa.

West Coast
WAVERLY PETROLEUM PRODUCTS CO.
Menlo Park, Calif.

taps on your mind?

ASK YOUR THREADWELL DISTRIBUTOR!

Personal attention to your orders for Taps by the Threadwell distributors can often save days of waiting. Threadwell HIGH SPEED Taps can be identified by the dot on the shank (red for cut thread, white for commerical ground, and blue for precision ground). They can also be identified by their OUTSTANDING performance on your production line.
Write for catalog today!

★

Export Stocking Distributors
CANADA: BRIDGE MACHINERY CO., MONTREAL
ENGLAND: SKYLUX LTD., LONDON

Threadwell
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE CO., GREENFIELD, MASS., U.S.A., FOUNDED 1902

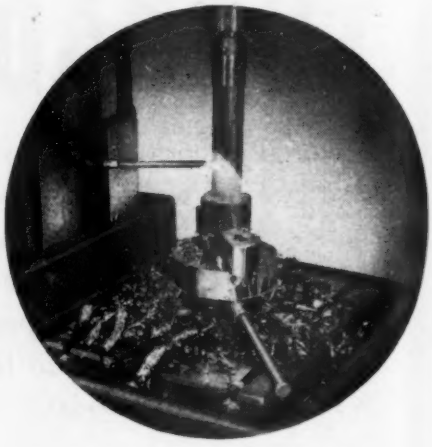
POWER —

TO DRIVE CUTTING TOOLS TO FULL CAPACITY

Tough drilling jobs present no problem to users of the Sibley 25" Geared Drilling Machine. Both now, when it is vitally necessary to get maximum production, and later in peacetime competition, the manufacturer using the Sibley can confidently tell his methods or time study departments to get "the most out of the tools" used on this machine.

Illustrated is the Sibley 25" Machine drilling through S. A. E. 1035 steel. Such work is easily and speedily handled as required. The tremendous power of this machine enables it to maintain the selected feeds and speeds on the toughest steels.

Among the outstanding features: quick change speed and feed levers, rugged construction, controls centered in front, and smooth operation.



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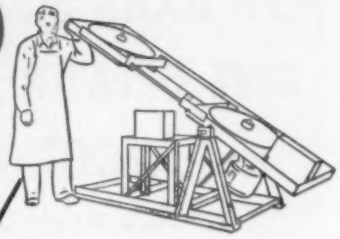
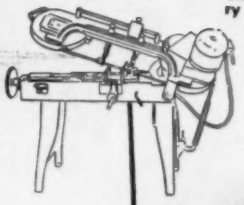
Wells SAWS
THE SIGN OF SERVICE

No. 9
General Foundry Saw.

No. 20
Designed for cutting risers off propeller blades.



No. 5
Ideal tool room size.

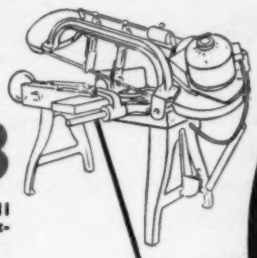


Wells

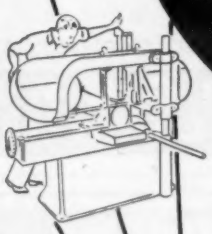
Fast-Accurate-Rugged

METAL CUTTING BAND SAWS

No. 8
Popular all around production Saw.



No. 12
Heavy duty production Saw.



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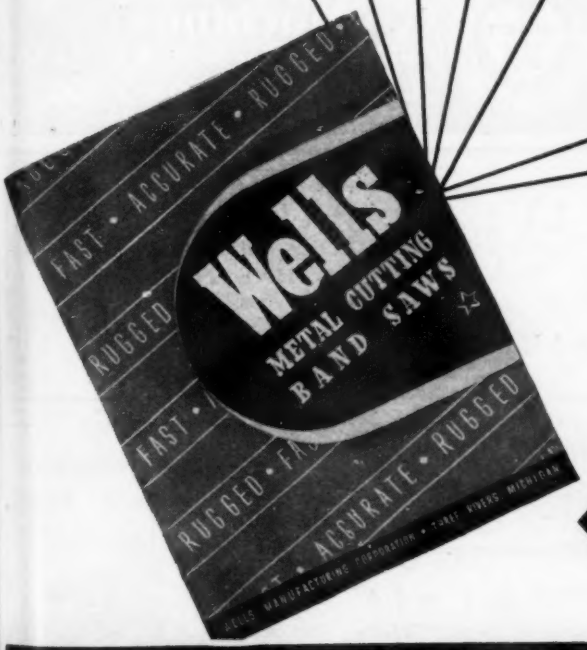
Available at all times.

STOCK STANDS
Indispensable item for your shop.


FAST • ACCURATE • RUGGED
Wells
METAL CUTTING BAND SAWS
RUGGED • FAST • ACCURATE • RUGGED
WELLS MANUFACTURING CORPORATION • THREE RIVERS MICHIGAN

WELLS METAL CUTTING BAND SAWS are engineered and designed for dependable long service in metal cutting efficiency, meeting the exacting requirements of present day demands on industry.

Whatever your metal cutting jobs are, call your distributor or write direct.

Wells Has Established Leadership

FREE NEW CATALOG on WELLS complete line is yours on request. Write or wire today.

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Wells **METAL CUTTING BAND SAWS**

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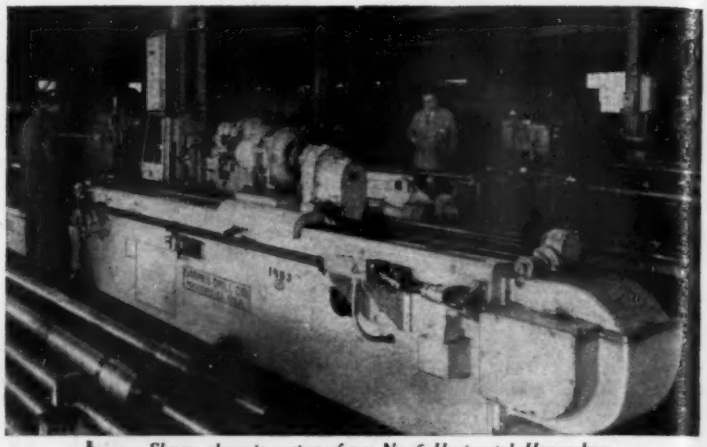
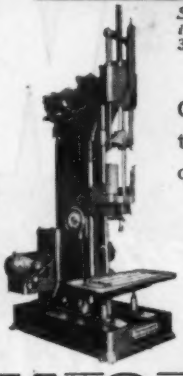
HOW BARNESDRIL HONERS GIVE GREATER ACCURACY and SMOOTHER FINISH

ON ALL CYLINDER BORES

IF YOU have a production problem involving the finishing of cylinder bores, BARNESDRIL Honing Machines will give you greater accuracy, smoother finish and higher production than can be attained by any other known process. Proper honing gives you desired surface finish. All defects of previous commercial operations, sueh as tool marks, hills and valleys, grinder marks, etc., are removed. The right BARNESDRIL Honing Machine for the job with the proper tools will provide the final accuracy of both roundness and straightness of the bore and final dimensional size accuracy within 0.0005" to 0.0002" tolerances. Whatever your finishing requirements, there's a BARNESDRIL Honer for the job. They are made in vertical, horizontal, and angular types, with one or more spindles.





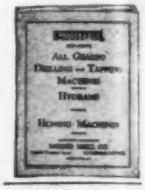
Shown above is a view of our No. 6 Horizontal Honer honing bores of anti-aircraft gun barrels. To the left is our No. 307 Standard Honing machine . . . adaptable to many jobs.

HELP ON YOUR HONING PROBLEMS

Our engineers will be glad to recommend the proper type and model honer for your specific production requirements. No obligation.

FREE HONING DATA

Here's a valuable booklet with complete details of the honing process and our entire line. Write for free copy of Bulletin A.



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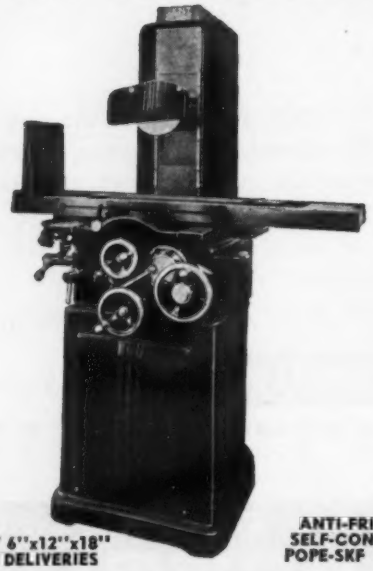
Barnes Drill Co. ROCKFORD ILLINOIS, U.S.A.

ATLANTIC

No. 2 Automatic Precision

SURFACE GRINDER



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POPE-SKF SPINDLE

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(Automatic and Semi-Automatic)

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LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine

THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
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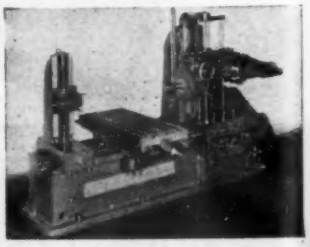
UNIVERSAL *Horizontal Boring Machine*

The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

Those Supplies You're Thinking About *Today*

Your I. S. D.* may have ordered on high priority *Last Month!*

Your Purchasing Department may be short-handed. Your Expeditors may be run ragged. But your *Industrial Supply Distributor is on the job—capable as ever, ready to help. *Are you using him enough?*

He knows what you need—the whole range from grommets to forge hammers. He knows where he can get them—he has many sources of supply. He buys more often than not on high priority. He orders in big lots—as often as he can, and as much as he can get. He buys for stock—in normal times he carries as many as 25,000 to 50,000 individual items.

It will pay you always to inquire of your Industrial Supply Distributor before you send directly to the factory—he may have anticipated you by ordering last month or the month before the very things you need tomorrow. Thus you avoid duplication, confusion, scattered effort. Telephone your Distributor FIRST! And save yourself both time and expense.

Your Distributor is your dependable supplier of Cle-Forge High Speed Drills Peerless High Speed Reamers, and other cutting tools that we manufacture.

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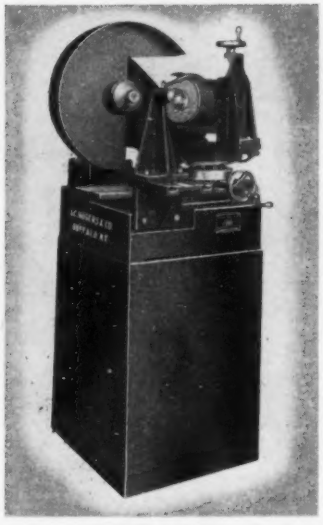
In These Days of SCARCITY . . .

KNIVES MUST LAST LONGER



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ROGERS CIRCULAR
KNIFE GRINDER

Rogers Grinders Conserve Knives

Sharpen your own knives and be independent of delays, higher costs and *unnecessary wear!* Finely adjusted automatic control assures *keen cutting edges . . . with minimum removal of metal.* No skilled operator required.

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Grinding
Shear Blade
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or Any Straight Knife
on Edge or Face

PRECISION QUALITY **ROGERS GRINDERS** SINCE 1887

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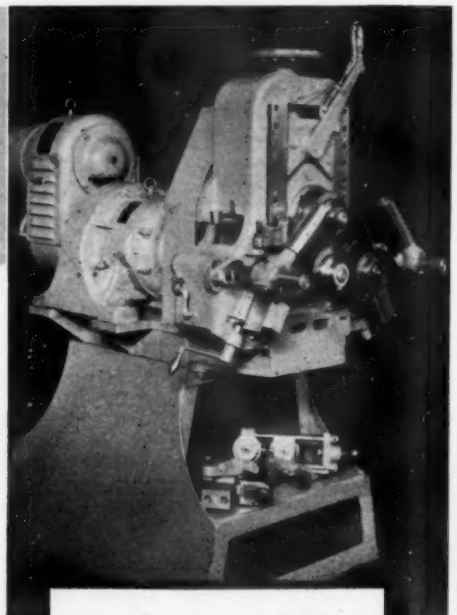
AIR MINDED TOOL!

"Buffalo" **BENDING ROLLS**
are Delivering on the Toughest Assignments



● Watch a Buffalo Bending Roll—*Aircraft Type*—at work! You'll be convinced at a glance: Here's a production tool designed by air-minded engineers. Embodying all the features demanded by aircraft builders—features such as simplified control, variable speed, versatility of bending and heavy-duty construction these special bending rolls have eliminated many a "headache" in fighting plane production—and are helping assure an ever-increasing output for Victory's knock-out blow.

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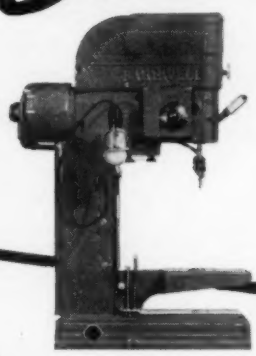
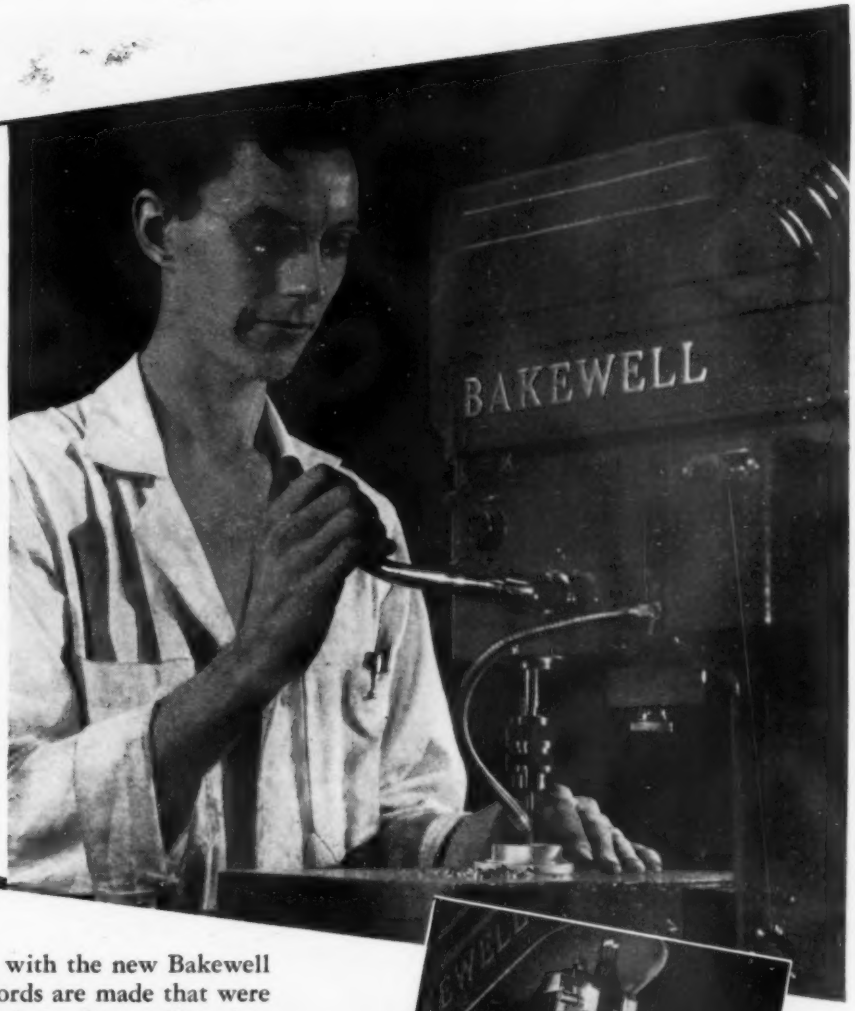
"Buffalo" AIRCRAFT TYPE **BENDING ROLLS**

What makes it *Click*



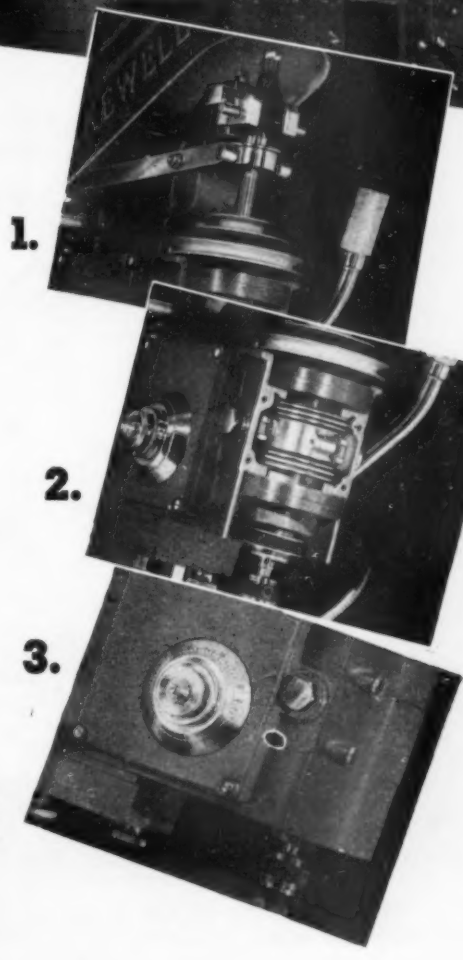


● Wherever small tapping is being done with the new Bakewell No. 0 Tapping Machine performance records are made that were never before possible. Precision cut threads in the smallest sizes are guaranteed by the patented Bakewell lead screw feed and electrically operated guide finger control. It's a precise feed that gives you precision thread exactly according to the pitch diameter of the tap. The tap is lead into and out of the hole in exactly the same path.

A sensitive solenoid actuated clutch practically eliminates tap breakage by releasing the instant the tap encounters difficulties in operation. Many times the normal tap life is assured.

The Bakewell limit switch gives tapping depth accuracy to .005". When blind holes are tapped the spindle reverses at practically the same point on each succeeding stroke. No time is lost when you work within these close traverse limits!

These are but three big reasons why this little Bakewell Tapping Machine will win the precision tapping production battle—why it will put wings on your war production if you're tapping to Class 3, 4 or 5 fits in 0-80 to 10-24 sizes.



1. *Hobbed lead screw cuts mating threads on "electric" guide fingers.*
2. *Adjustable clutch releases when tap becomes dull or hits chips.*
3. *Depth and height limits are regulated to within 1/10 of a cycle.*

BAKEWELL *Manufacturing Co.*

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THEY'RE Faster
AND GO FARTHER
American planes today have what it takes! Speed — wider cruising range — greater firepower — maneuverability! All this — due to the ingenuity of aviation engineers and machine tool builders — working with the right kind of tools. That's where Wesson Carbide Cutting Tools are doing their part — *cutting tougher metals, faster, with greater precision, with minimum rejects.* » » » Pioneers in "tooling up" for aviation motor production, Wesson Company is constantly setting new standards of precision and speed in Carbide Cutting Tools.
The counsel of Wesson engineers — skilled in engineering and designing of cutting tools — is available to help solve present war production problems, or for post war planning.
WESSON CO., DETROIT, MICH. (Ferndale Station)
WESSON
Carbide Cutting Tools
First choice when tough metals are to be cut — for special or standard purposes — for single or multiple setups.

WHEN THE WAR IS OVER we'll enjoy higher standards of living here in America. Automobiles, airplanes, tractors and trucks — household appliances — every machine and tool that's made of metal — will be better, safer, stronger.

Wesson Carbide Cutting Tools will help to make this possible by cutting *tougher* metals, with greater precision. And these things will cost less to buy — they'll operate more efficiently and more economically — they'll be safer and will last longer.

Tested under all manner of shop conditions, Winter taps have proven to be consistently good. Now, with *production* so vitally important, it is imperative that taps turn out vast quantities of perfectly threaded pieces.

It is this tested quality to produce long after you would expect to discard them that has made Winter Taps the approved threading tools in hundreds of war factories.

A Division of

THE NATIONAL TWIST DRILL & TOOL CO.

Detroit, Michigan

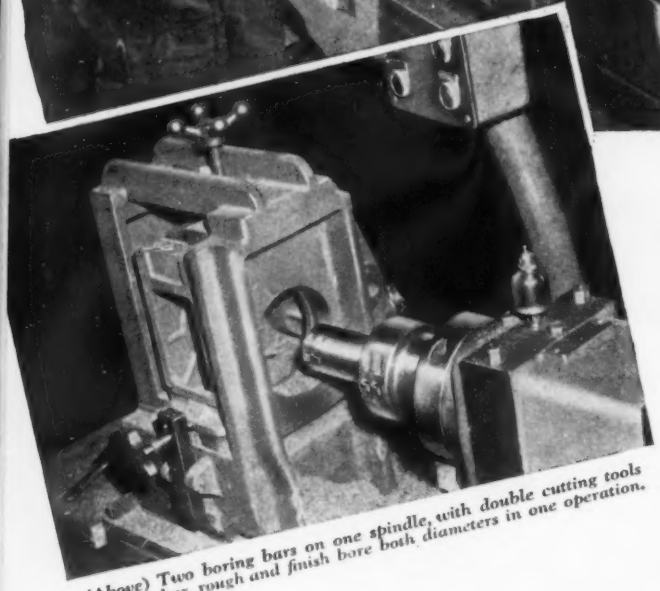
Winter Brothers

COMPANY

Wrentham, Massachusetts, U. S. A.

Rough and Finish Boring Both Main Bearings in Crankcase...in One Operation

(Below) Crankcase for single-cylinder gasoline engine, showing main bearings of different diameters and lengths of bore.



(Above) Two boring bars on one spindle, with double cutting tools on each bar, rough and finish bore both diameters in one operation.

(Above) One operator maintains accuracy to ±.0005" with fine finish in production. Total boring time is 2½ minutes per piece.

STOKERUNIT SIMPLEX *Precision* BORING MACHINE

maintains accuracy of ±.0005" with high finish

Total Actual Boring Time 2½ Minutes per Crankcase

This crankcase for a single-cylinder gasoline engine has two main bearings of different diameters and lengths of bore—one 6" in dia. with 3/8" length, and the other 3" in dia. with 5/8" length. Stock removal on the rough cut is 1/8" and on the finish cut .010". Required accuracy is ±.0005" with high finish.

To accomplish a precision boring job like this *in one operation* demands sturdily built precision boring equipment of highest operating efficiency.

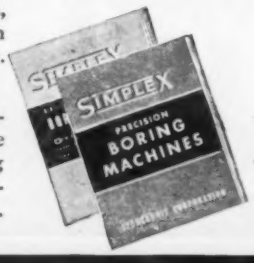
On this job, the No. 2U Stokerunit Simplex Single-End Single-Spindle Precision Boring Machine meets every rigid requirement of production, accuracy and finish.

Illustration at left shows the two boring bars on one spindle, one bar for each diameter. Each bar is fitted with two tungsten carbide tools. The first tool in each set does the roughing operation on both diameters. As soon as the first tools clear the work, the second tool in each set follows for the finishing operation.

Actual boring time for all operations on both diameters is 2½ minutes; required accuracy and finish are consistently maintained. Spindle speed is 300 r.p.m.; feed 3/4" per minute.

TO SOLVE YOUR PRECISION BORING PROBLEMS . . . get the complete Stokerunit story today. Over 25 models of Stokerunit Simplex Precision Boring Machines are available and cover practically the entire range of precision boring applications. They can be furnished in both mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work.

For specific recommendations, send blueprints of parts with your production requirements. There is no obligation.



WRITE TODAY for these two booklets, which contain complete data and specifications covering the entire line of Stokerunit Simplex Precision Boring Machines.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHI

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TOOL BITS ARE "WAR WEAPONS"

Insure Their Accuracy the OLIVER Way!

Tool bits and forged tools are doing a big job in this war. It's important that they be made right—and kept right! The Oliver Template Tool Bit Grinder can reproduce accurately and rapidly the correct contour of any single-point tool. Using a master template formed to the required tool shape, it produces correct top rake, accurate clearances, and sharp cutting edges. Accurate, uniform results can be obtained even by comparatively unskilled operators. Heavy, rigid and vibrationless, it can grind carbide and other high speed tools rapidly and accurately.

Keep war production accurate and fast by keeping tool bits—your "war weapons"—in perfect cutting condition. Write for bulletin explaining in detail how the Oliver Template Tool Bit Grinder can do this job—quickly, easily and economically.

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1410 E. Maumee St., Adrian, Michigan

Don't Neglect Your Toolroom It's the Backbone of Production!

Oliver OF ADRIAN

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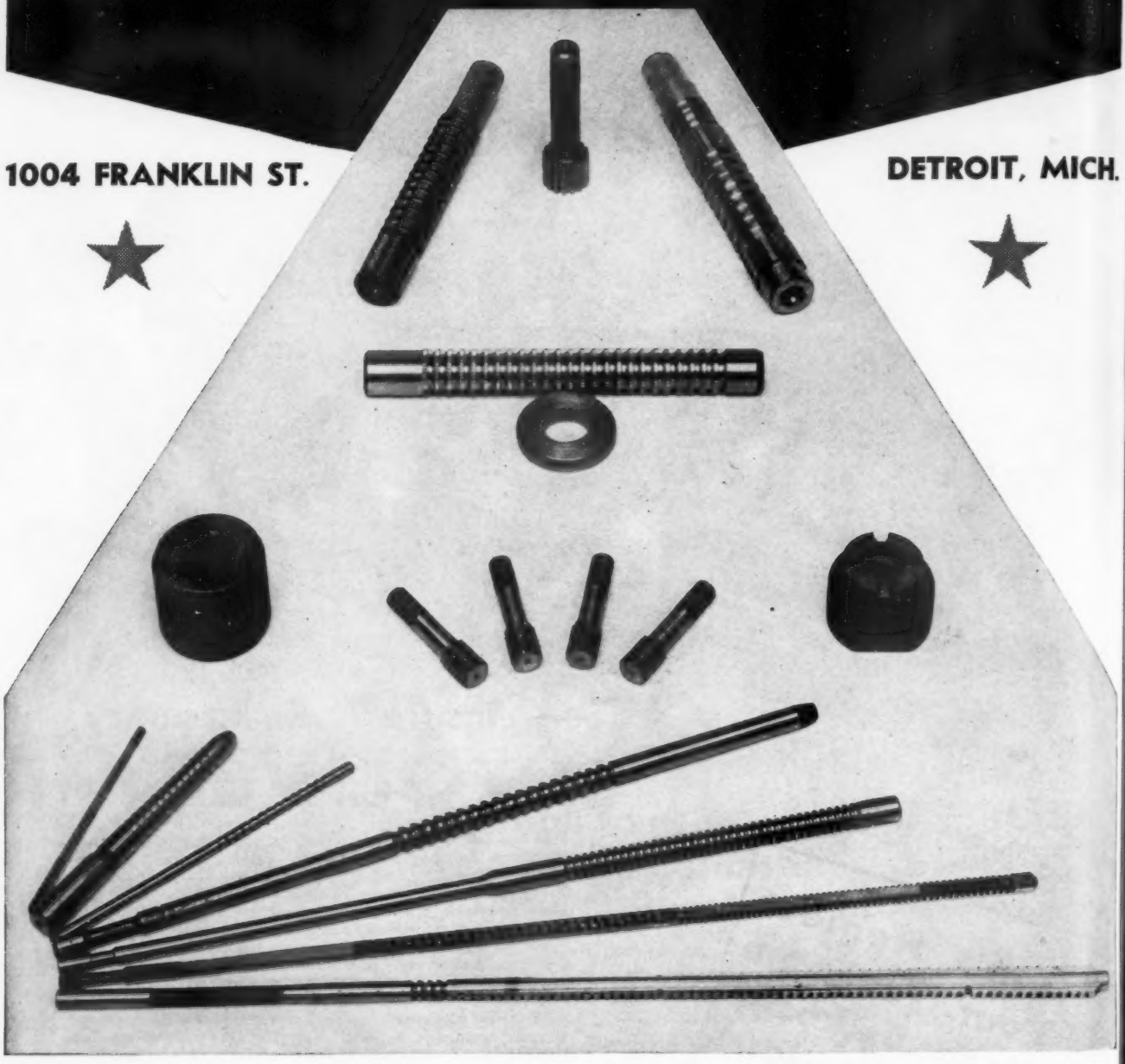

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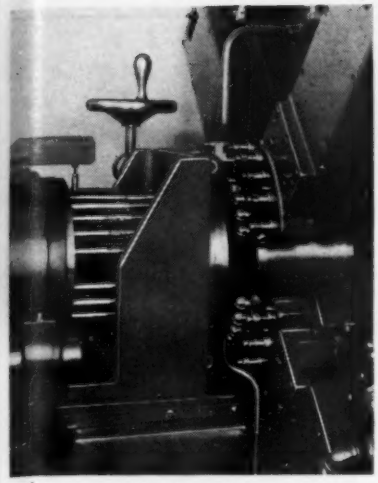
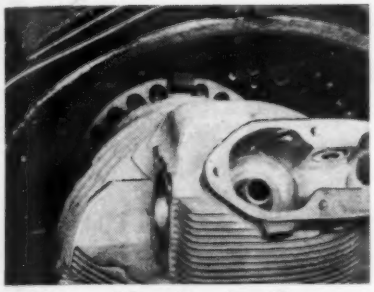
ALSO INTERNAL AND EXTERNAL GEAR TOOTH FORM GRINDING.

X-Ray, Inc., our new associate company specializing in Metallurgical Radiography, now also under operation.

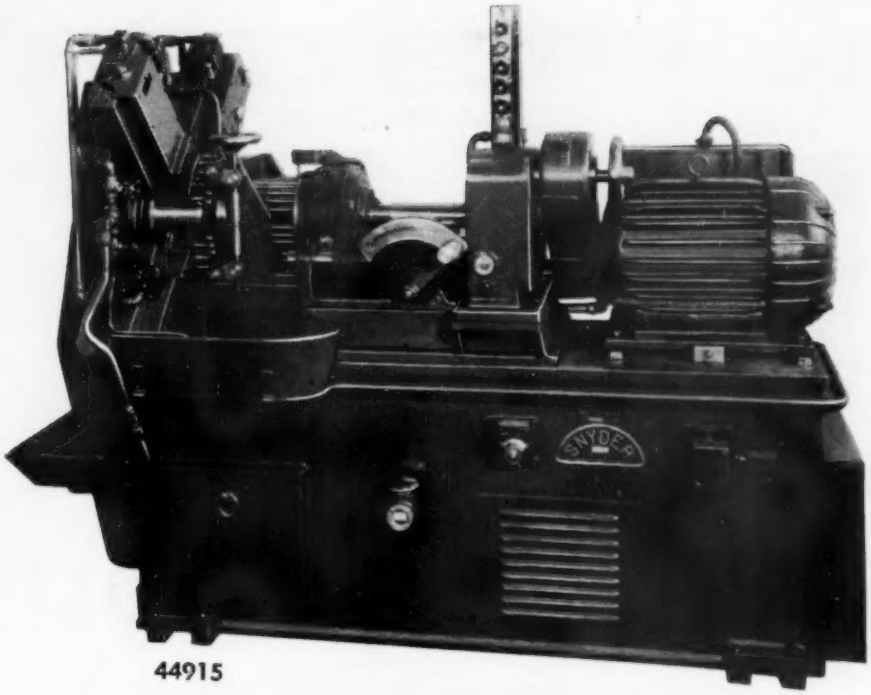
BEHIND OUR BOYS FOR VICTORY



View of Cutting Assembly



View of Loading Position



44915

MULTIPLE-SPINDLE HYDRAULIC BACK SPOTFACING MACHINE

THIS special multiple-spindle machine was designed and manufactured by Snyder to back spotface at one time the entire set of bolt holes on the flanges of cylinder barrels for aircraft engines. It has a production rate of 26 pieces or more per hour.

The cylinder head assembly is loaded and clamped manually in a horizontal position on a sliding fixture. Cutting tools run in plain nitrided steel bushings and are mounted on hydraulically actuated tool slides, which move away from the work to facilitate loading.

After the part is located, the cutters are brought into correct working position. The multiple-spindle driving head is then manually advanced so that the drivers pass through the bolt holes and engage the cutting tools for spotfacing. The operator rotates the drivers manually to assure full engagement with the cutting tools. It is not necessary for him to touch the cutting tools.

With the drivers and tools fully engaged, the Snyder machine is ready for its working cycle. This consists of rotating the tools under power and feeding the cylinder head against the cutters. When the full depth of cut has been reached, the tools dwell in the work momentarily for a smooth finish of the machined surface. The base of the machine contains coolant as well as hydraulic tank and piping.

This special application of a multiple-spindle machine is another example of how Snyder engineering has helped manufacturers of aircraft, gun and tank parts to step up production and, in many cases, to secure greater accuracy. For other examples, as well as details of standard Snyder machines which often accomplish the results of special machines, write for the new Snyder book of machine tools.

SNYDER
TOOL & ENGINEERING CO.
3400 E. Lafayette Ave. • Detroit

designers and builders of machinery for HIGH *production at* LOW *unit cost*

QUALITY CONTROL!

● The procurement and control of the steels that go into WELDON TOOLS is held to very rigid specifications . . . The modern and complete chemical and physical testing and micro-analysis equipment of WELDON'S Metallurgical Laboratories insure the continuing high standards of WELDON TOOL materials . . . That WELDON standards have not been the least relaxed in spite of increasing demands of war production is evidenced by the superior performance of WELDON TOOLS on the job! . . . The WELDON war effort can be fully realized only by jealously maintaining the 25-year WELDON reputation for quality tools!

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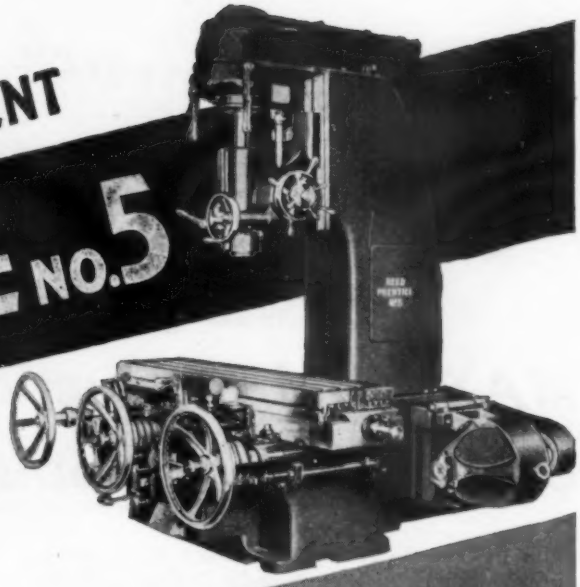
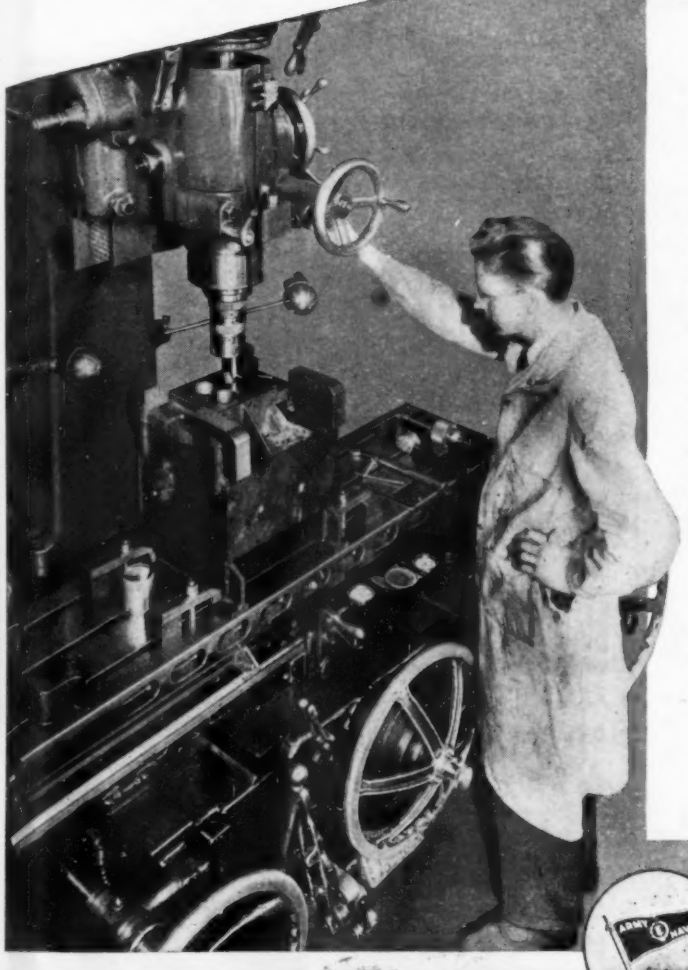
REED-PRENTICE NO. 5 JIG BORER





Yes, we can now make immediate delivery on the Reed-Prentice No. 5 Jig Borer.

This rugged, versatile, and accurate tool is particularly suited to the problems of war production, being capable of milling, drilling, or boring. Distance from end of spindle to table is 30". Illustrated is a typical boring job. Accurate location of holes is accomplished by dial indicators and end measures which are standard equipment. Power down feed is also supplied as standard equipment.

SPECIFICATIONS

Working Surface of Table	60" x 16"
Longitudinal Power Feed	48"
Cross Power Feed	16"
Rapid Power Traverse— Either direction	100"
Net Weight	12,000 lbs.

BRANCH OFFICES
1213 W. 3rd. St.
Cleveland, Ohio
75 West St.
New York City, N. Y.

REED-PRENTICE CORP.

MAIN OFFICE
WORCESTER
MASS. U. S. A.

THE Ettco-Emrick SYSTEM OF MULTIPLE SPINDLE HEADS

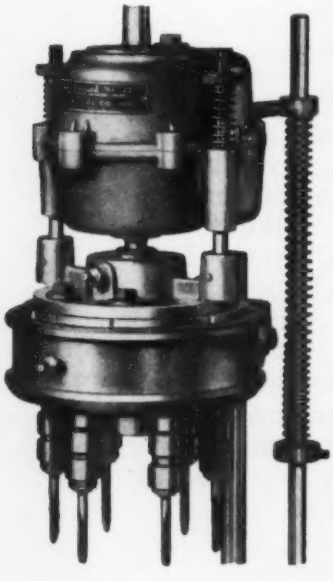
will give you

MAXIMUM production on Drilling or Tapping

Note that word "system". It means that when you order an Ettco-Emrick Multiple Spindle Drilling or Tapping Head you get much more than just a piece of equipment.

You get a Head that has been engineered to fit the **method of handling** which will give you **maximum** production in drilling or tapping the specific part for which the Head is ordered.

In addition you get working drawings of the **holding fixture** in which the specific part can be **quickly and accurately set up** and **progressively fed** for the drilling or tapping operations.



A typical Ettco-Emrick Multiple Tapping Head for tapping 6 holes simultaneously. A Quill Clamp is supplied with every Head to assure the rigidity needed for high precision work. The same gear case assembly is used for drilling the holes.

In short, The Ettco-Emrick System assures you of **maximum** production because it satisfies every requirement for maximum production.

RANGE OF THE SYSTEM

The System covers the high speed drilling of holes from wire sizes to ½" inclusive and the tapping of holes from machine screw sizes up to 5/16" inclusive using our centralized driving and reversing mechanism.

DETAILS OF THE SYSTEM

Space does not permit giving details here. But they are all covered in BULLETIN No. 3. A copy of this Bulletin will be mailed to you on request. Write for it today.

ETTCO TOOL CO.

590 Johnson Ave., Brooklyn, N. Y.

Detroit ● *Chicago*

The famous Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

DON'T WAIT FOR TURRET LATHES

Convert any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing

● This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held.

6 Days Delivery

Pat. Pending

4-Tool Tool-Post Turret

● Then there's the completely modernized 5-tool TAIL-STOCK TURRET (below right), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.

The Jefferson Bull-Dog Precision Milling Machine. Obtainable Power or Hand Feed.

5-Tool Tail-Stock Turret

Pat. Pending

● **ALSO—*Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.***

JEFFERSON MACHINE TOOL CO.

SO. SWEENEY, CUTTER & FOURTH STS. CINCINNATI, OHIO

"TIME SAVER"

Improved holder with interchangeable steel type makes part number changes a simple operation. Turn a screw to make the change. . .Guaranteed for years of service. Used by hand or press, it's a time and money saver.

PROMPT DELIVERIES

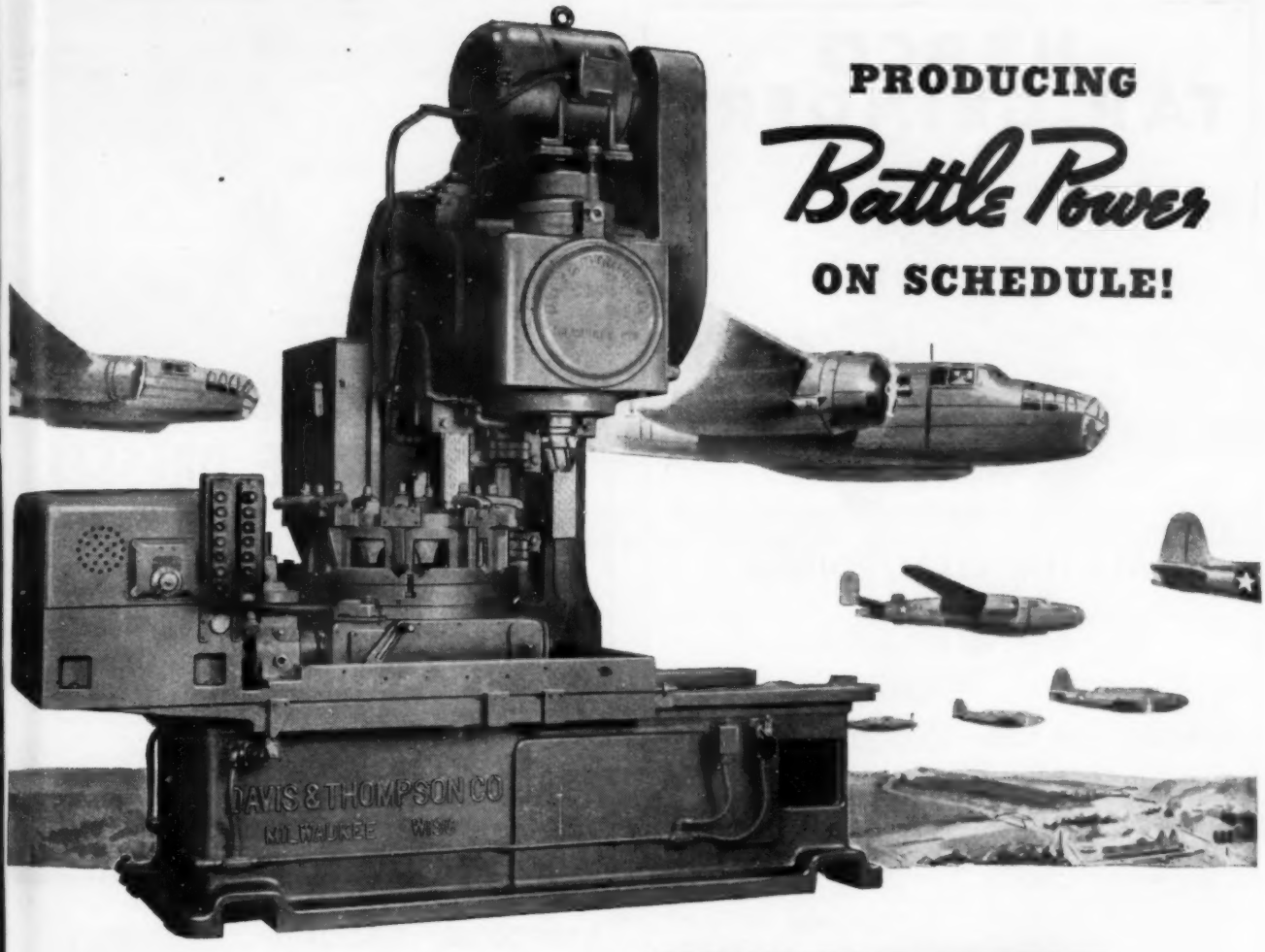
STOCK SIZES:

TYPE #1

TYPE #2

TYPE #3

SOSSNER 161 GRAND STREET NEW YORK CITY

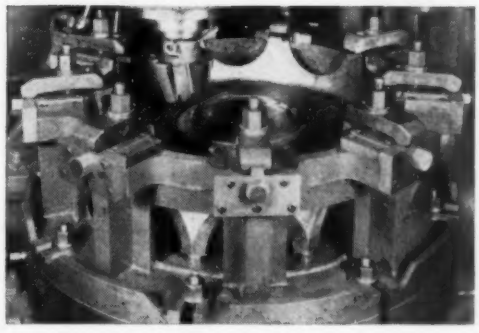


PRODUCING *Battle Power* ON SCHEDULE!

FULLY automatic, electrically controlled, hydraulically operated, this 34″ open vertical type D&T miller speeds the contour milling of the inside of crankcases for radial type airplane motors, on the fastest schedule ever established.

All the operator has to do is load the part into the fixture, push the cycle button, and unload the finished crankcase. Rapid traverse speeds the table to approximate milling position. Rapid traverse lowers the head. Then, in "feed" speed, head and table move to precise operating position . . . the table rotates, the milling cycle is completed, the table backs away, and the head rises again to the loading position, ready for the next crankcase! All automatic . . . fast . . . accurate!

Thirteen tons of metal are engineered without waste into this smooth-working precision machine. It stands 12′ 10″ high . . . is remarkably compact, using floor space only 8′ 4″ x 5′ 10″ . . . has a husky 5⅞″ spindle with 8⅞″ flange, with change gears for various spindle feeds. Entire head equipped with frictionless



FULLY AUTOMATIC . . . FAST . . . ACCURATE

bearings . . . precision roller bearings on spindle . . . ball bearings at all other bearing surfaces.

Similar machines, with rotary tables up to 87″, mill large gear blanks, tank rings, and other big parts . . . fast!

Send for our "Victory Production" book. It cites many other typical examples of rugged, compact, automatic D&T multiple-spindle boring, drilling, milling machines specially designed for high production.

DAVIS & THOMPSON CO., *Milwaukee, Wis., U.S.A.*

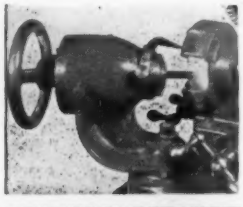
Buy More U. S. War Bonds

D&T ROTO-MATIC HIGH PRODUCTION MACHINERY

HYBCO TAP GRINDERS

ALL THE VITAL POINTS

Lengthen Tap Life—Salvage Broken Taps



Sharpening Chamfer

All lands sharpened with each revolution of hand wheel—relief and chamfer angle variable.

Grinding Flutes

Easily and quickly reproduce or change hook. Upright position affords unobstructed view of work.

Grinding Spiral Points

Spiral points can be produced or duplicated with adjustable head on verticle slide.

All Taps Held by Shank

CAN BE SHARPENED AFTER CENTER IS DESTROYED

OTHER FEATURES: Belt driven precision ball bearing spindle permits use of any type motor.

Capacities—Machine Screw to 1½" hand taps—2 to 10 flute right and left hand. Three sizes inter-changeable heads—each engineered for specific range.

Three Models—Bench Type—Floor Type—Floor Type with built in Dust Collector.

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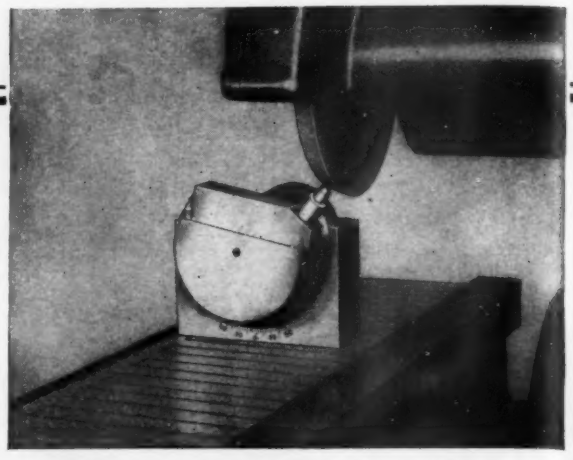
HENRY P. BOGGIS & CO.
1279 W. 3rd St. **Cleveland, Ohio**



QUICK ANGLE DRESSER

THE Welch Quick Angle Dresser can be set quickly for dressing the grinding wheel to any desired angle. It is compact, durable; simple in construction. All surfaces are hardened and ground. Furnished in plain or Vernier type. Plain dresser graduated in degrees. . . . Vernier reads in degrees and minutes. The Vernier being an integral part of the base block eliminates any possibility of error. 10 DAYS FREE TRIAL IF DESIRED.

Write for particulars

Plain Type, $70 Net

•

Vernier Type, $82.50 Net

Welch **INDUSTRIES INCORPORATED**

Makers of High Speed Milling Cutters . . . Form Tools and Special Tools

20,000 West Eight-Mile Road **Detroit, Michigan**

UNIFORMLY GROUND TOOL BITS KEEP SCREW MACHINES IN FULL PRODUCTION

- **More Pieces Per Grind**
- **Increased Machine Capacity**
- **Savings in Set-Up Time**
- **Tool Steel Conserved**

With Boyar-Schultz Model F Grinding Fixture mounted on a surface grinder, the recommended clearances difficult to grind by hand are easily and quickly produced. Substantial savings are to be accomplished with this fixture.

Stocks of bits can be ground for central stores with assurance that all bits will be ground exactly the same.

Write For Complete Description

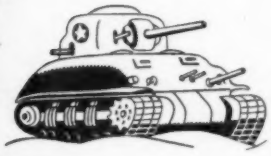
BOYAR-SCHULTZ CORPORATION
2109 Walnut Street **Chicago, Inninois**

"Turn to Turchan"

. . . FOR FASTER PRODUCTION

. . . FOR BETTER WORKMANSHIP

. . . FOR FEWER REJECTS



DAY AFTER DAY, as America's mighty array of machine tools pour forth the things destined to keep men free, more and more Turchan Followers are becoming main-stays of industry.

Day after day more and more production men, harassed by high-pressure schedules, new machining jobs and inexperienced workers, see fit to *Turn to Turchan* the all-hydraulic duplicator, for solution of their troubles. You, too, can *Turn to Turchan* and save time, money and reject worries.

Turchan Followers attach easily to any standard lathe, planer, shaper, grinder or mill. They make it possible for any comparatively inexperienced operator to perform any machining operation any lathe, planer, shaper, grinder or mill can perform. Furthermore, he will do it better, faster and more economically.*

Turchan Followers are not costly machine tools. Rather, they are relatively inexpensive attachments to machine tools. And, unlike any other duplicating device available today, they do not interfere with normal use of the machines to which they are attached. That's why we say: IT WILL PAY YOU TO *Turn to Turchan.*

**Let us prove this statement to you.*

"Turn to Turchan"

TURCHAN FOLLOWER MACHINE CO.

Originators of Hydraulic Duplicating

8251 Livernois Avenue — Detroit, Michigan

The Book of the YEAR!

VICTORY SCREW THREAD
DATA BOOK
With
Foreign and Domestic
THREAD SYSTEMS

CONTENTS

Definitions • Thread Series • Fits (Description) • Marking Symbols • Stockable Chaser Sizes • Coarse Thread Series—Basic Dimensions • Proposed National Extra Fine Thread Series • 27 Pitch Lighting Fixture and Brass Tubing Threads • Fine Thread Series—Basic Dimensions • Tolerances for Screws and Nuts Class 2 and 3 • 8, 12 and 16 Pitch Series • Class 2 Tolerances for Coarse and Fine Thread Series for Screws and Tapped Holes • Tap Drill Sizes for National Coarse and Fine Threads • American National Pipe Threads—Straight Pipe Threads • Acme Threads • Stub Acme • SAE Fuel, Oil and Tube Fitting Thread • Stub 60° Thread • Spark Plug Thread Sizes. British Standard Whitworth • British Standard Fine Thread • British Association Thread • Cycle Engineers Institute Thread • British Standard Pipe—Taper and Straight • International Metric Thread • French Standard Metric Thread • French Standard Thread • Lowenherz Thread—Decimal Inch Equivalent of Millimeters • Equivalent of Metric Pitches in Inches and Threads Per Inch • Three Wire System of Measuring Threads • Decimal Equivalents • Single and Double Depths of American National Whitworth and V Threads Compared • Cutting Speeds—Surface Feet • Weight of Bar Stock Per Foot • Guide for the Design and Purchase of Screw Machine Products • SAE Steels (Analysis) • Important Suggestions on the Design of Threaded Parts.

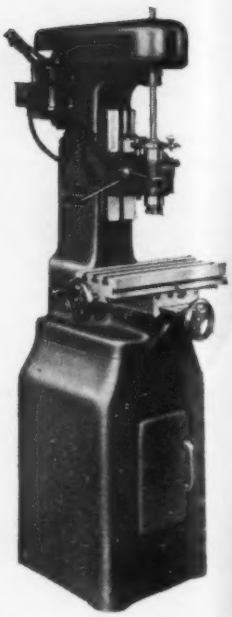
FREE to Factory Executives who request it on a business letterhead; others, 15 cents

H&G DIE HEAD

The Eastern Machine Screw Corp.
Manufacturers of H & G Die Heads

20-40 Barclay St. **New Haven, Conn.**

HIGH SPEED
Precision
DIE WORK, JIG AND MODEL MAKING, METAL PATTERNS, DRILLING, MILLING, REAMING, JIG BORING



LINLEY THE
machine that "can take it"
. . . and do it.

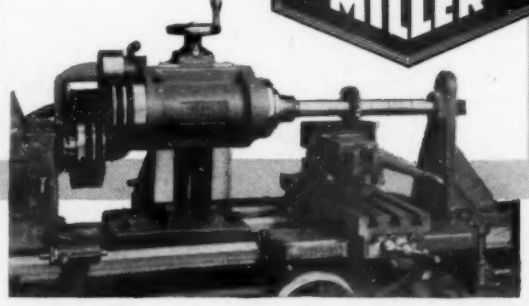
From every point of view . . . compactness, rigidity, accuracy, speed and versatility, the Linley Milling and Jig Boring machine can be the busiest unit in a busy toolroom. Eight spindle speeds from which to choose, direct micrometer setting to eliminate pencil figuring errors, counterbalanced quill to remove blacklash . . . and a large capacity for such a small (18½" x 20" floor space) machine.

You'll want full details . . . write today.

LINLEY BROTHERS COMPANY
664 State St. Extension
BRIDGEPORT, CONN.

Makes a Milling Machine out of your lathe in 3 minutes!

GLOBE MILLER



Quickly attached to your lathe, the Globe Miller, with accessories, does all types of precision milling, yet costs only a fraction as much as a heavy milling machine. Increases lathe swing 5 to 10 inches, depending on lathe size, uses all lathe speeds and feeds. Write today for descriptive folder.

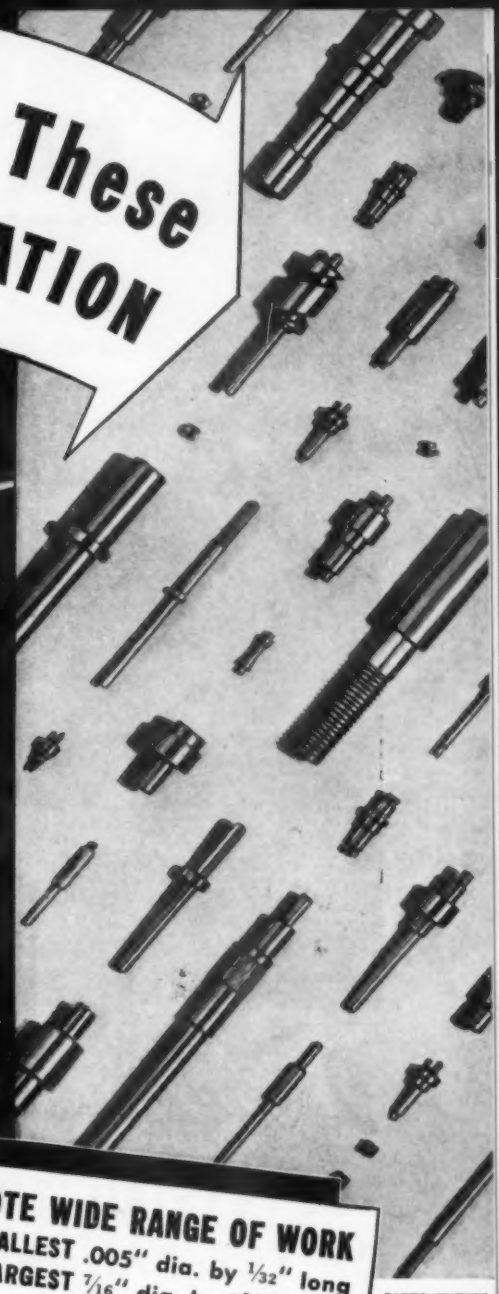
GLOBE PRODUCTS MFG. CO.
3382 Robertson Boulevard Los Angeles, California

PRECISION PARTS Like These *Complete*..IN ONE OPERATION

Product of Two Names Famous for *Precision*

The Original Swiss PETERMANN Model P-7

Re-engineered by GORTON Improved - Modernized



NOTE WIDE RANGE OF WORK
SMALLEST .005" dia. by 1/32" long
LARGEST 7/16" dia. by 2¾" long

PARTS SHOWN ACTUAL SIZE

GORTON 16 A Precision Automatic Screw Machine achieves new advances in accurate, high speed, versatile screw machine production. Diameters from .005" to 7/16" and lengths from 1/32" to 2¾" demonstrate the extensive range of work which can be produced on the 16-A.

The samples, shown here in actual size, represent the almost endless variety of simple and complex precision parts which the 16-A produces—complete—in *one* operation.

In addition to step and contour turning and chamfering, the 16-A, with attachments, also automatically performs centering, drilling, threading and slotting operations.

EXCEPTIONAL ACCURACY AND QUALITY OF FINISH—High diametrical accuracy—work rigidly supported at point of cutting tool load. Unusually high finish—grinding often eliminated.

LOW TOOL AND OPERATING COST—Maximum accessibility for quick setups. Uses only standard single point tool bits. Micrometer adjustments on every tool. Centralized controls—infinitely variable speeds and cam feeds at touch of dials.

LONG LIFE OF PRECISION PERFORMANCE—Slow, smooth operating movements, elimination of indexing or spindle reverse, and complete freedom from vibration insure a long life of efficient service.

COMPLETE TOOL AND CAM SERVICE... *No charge or obligation*

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OUR GOLDEN ANNIVERSARY 1893-1943

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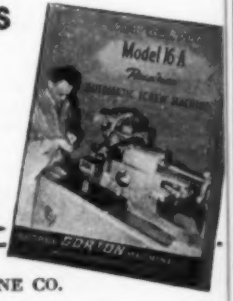


GEORGE GORTON MACHINE CO.
1315 Racine St., Racine, Wis.

Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic.

Name..... *Title*.....

Company.....

Address.....

City..... *State*.....

GORTON 50 YEARS OF PRECISION TOOLS

GEORGE GORTON MACHINE CO.

1315 RACINE STREET, RACINE, WISCONSIN, U. S. A.

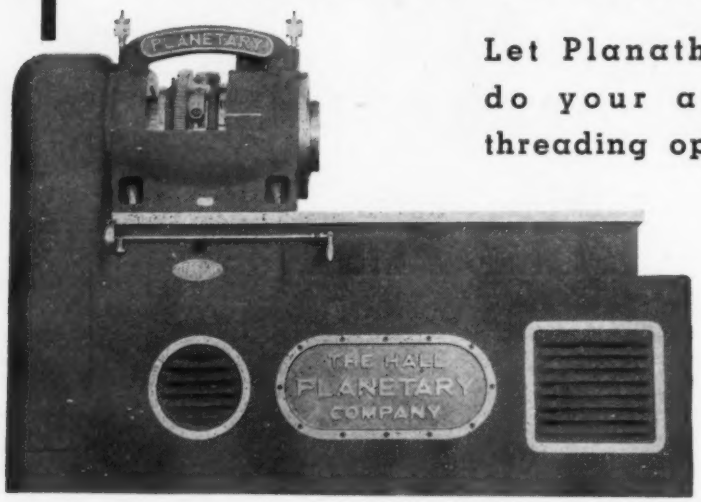
SPECIALISTS FOR 50 YEARS IN REPRODUCING FROM MASTERS—ENGRAVING, DIE MAKING, VERTICAL MILLING MACHINES

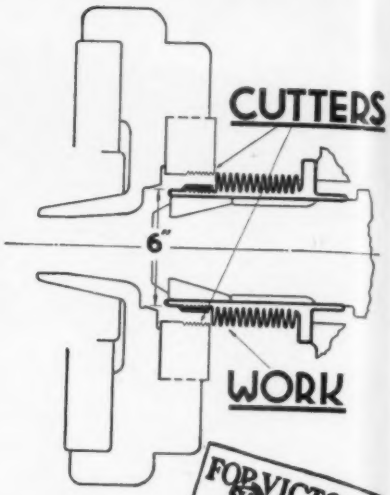
PLANATHREADING

Milling the thread on airplane cylinder sleeves! This thread and pilot diameter must be held in true relationship and size. They are so held by Planathreading.

THE TIME IS SIX MINUTES

Let Planathreading do your accurate threading operations.





The
HALL PLANETARY CO.
Fox St. & Abbotsford Ave.,
PHILADELPHIA, PA.

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

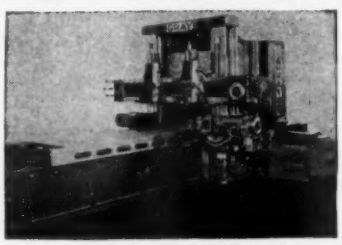
The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 15

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

THE GRAY LINE

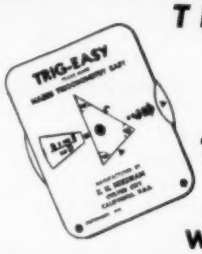


PLANERS
MILLING PLANERS
MILLING MACHINES
(Planer Type)
HORIZONTAL BORING MACHINES
(Floor Type)

Write for bulletins giving detailed specifications

The G. A. GRAY CO.
CINCINNATI, OHIO

This Amazing Chart
TRIG-EASY
Makes
TRIGONOMETRY EASY
Without Knowing Higher Math.



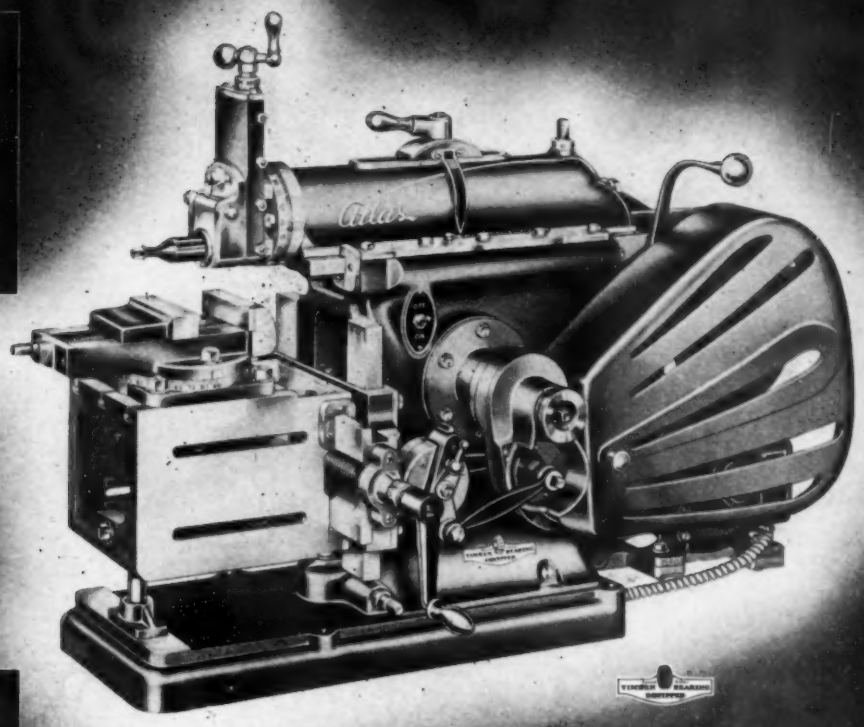
With the amazing TRIG-EASY Chart, YOU quickly find correct equations to solve Trigonometry problems used in Tool and Die—Machine Shop—Sheet Metal—Patterns—Inspection, etc. Send only 50c (coin) for this amazing and accurate time-saver, needed in every shop to help break bottlenecks. (Quantity discounts for industrial users.)

E. H. NEEDHAM, Dept. 1-B, Culver City, California

KEEP 'EM BLASTING

BUY WAR BONDS

Atlas
7-INCH
SHAPER



SPECIFICATIONS

Ram Stroke	½" to 7"
Strokes per Minute	45, 78, 122, 200
Cutting Speeds	3½ to 116 fpm
Table Travel, horizontal	9⅜"
Table Travel, vertical	4⅞"
Overall Dimensions	36"x17"x26" high

Crank-type bull-gear drive, complete V-belt drive, 5 automatic cross feeds, Timken tapered roller bearings, integral countershaft, built-in on-off motor control switch.

1943 PRODUCTION FORMULA:
"Match the Machine to the Job"

"American industry will achieve 100% of war production capacity by the middle of 1943 . . ." That prediction must be fulfilled. The hopes of the free world are in the machine shops of America.

One sure way to reach that goal is to use machine tools to the limit of their capacities to make the most of every production hour. It means "match the machine to the job": massive machines where size and power are really needed — *modern, fast precision tools to take over small-parts production so that capacities of larger machines will not be wasted.*

Outstanding examples of compact modern machine tools are those in the Atlas 4 Tool Team for Small-Part Machining — Lathes, Milling Machines, Shapers, Drill Presses. Ask your Atlas supplier to give you the facts about their production capabilities or write us. Atlas Press Co., 504 N. Pitcher St., Kalamazoo, Mich.

ARMY E NAVY

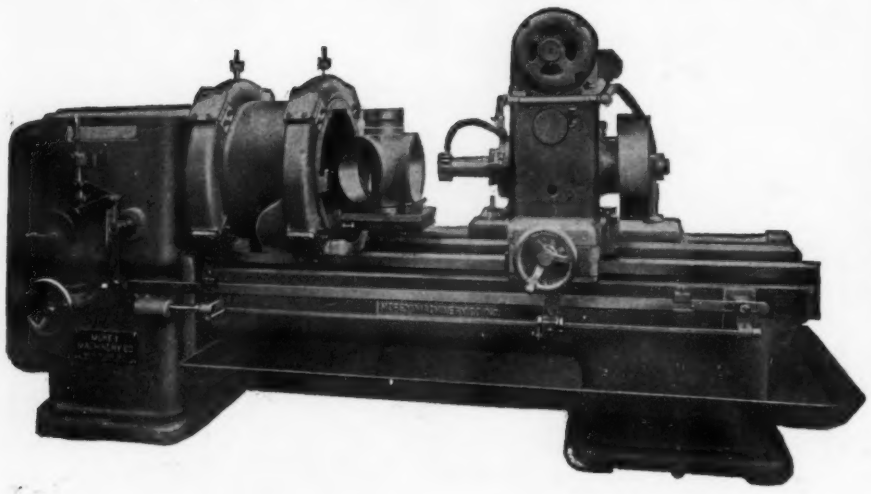
Atlas
ATLAS PRESS CO.

Atlas
4 TOOL TEAM
FOR
SMALL-PART MACHINING

1. LATHES
2. MILLING MACHINES
3. SHAPERS
4. DRILL PRESSES

MOREY DESIGNED AND BUILT *For* PRECISION *Plus* PRODUCTION

MOREY-SHIELDS THREAD MILLING MACHINE



Maximum diameter	Distance between centers
12"	60"
12"	90"
12"	120"

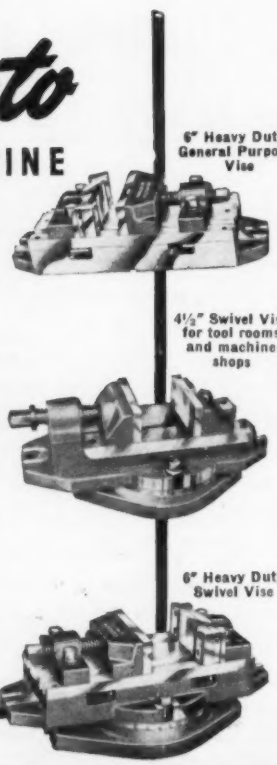
Longer beds to order

• Hole through spindle 4 1/16" . . . Headstock—a complete self-contained unit . . . Simplicity in selecting varying cutter speeds and feeds . . . Extra heavy and rigid bed section . . . Motor driven cutter head, fully universal . . . Control—convenient to operator . . . Equally efficient for external or internal thread milling, with either single cutter or a hob.

Ask for Circular No. 737

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

Producto
MODERN MACHINE *Vises*



• There are no Vises that compare with PRODUCTO Vises.

These superior and modern Vises are so much better than the conventional design.

Bodies fitted with hardened and ground wearing plates—extra large opening between jaws—large screw and nut for movable jaw—make these 4½" and 6" Vises practicably indestructible and useful for very long wear.

We also make Cam Lock Vises in 4", 5" and 7" sizes for production milling and drilling operations. Best vise for this purpose.

Don't bother with old tools—use Modern Machine Vises.

Ask for 8-page circular—

Also manufacturers of Producto Die Sets and Die Makers' Accessories.

The
PRODUCTO MACHINE COMPANY

940 HOUSATONIC AVE. BRIDGEPORT, CONN.

3017 MEDBURY, DETROIT, MICH.

KNIGHT VERSATILE MILLERS ACCURATE RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.

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DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1 ¼ in.

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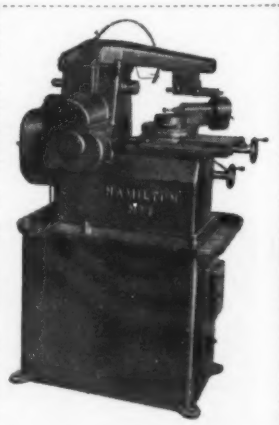
DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

HAMILTON
SWISS TYPE
GEAR HOBBERS

. . . for accuracy and speed in hobbing PINIONS, GEARS and SECTORS.



TWO MODELS

No. 00 SPUR GEAR HOBBER for work up to 2" dia.

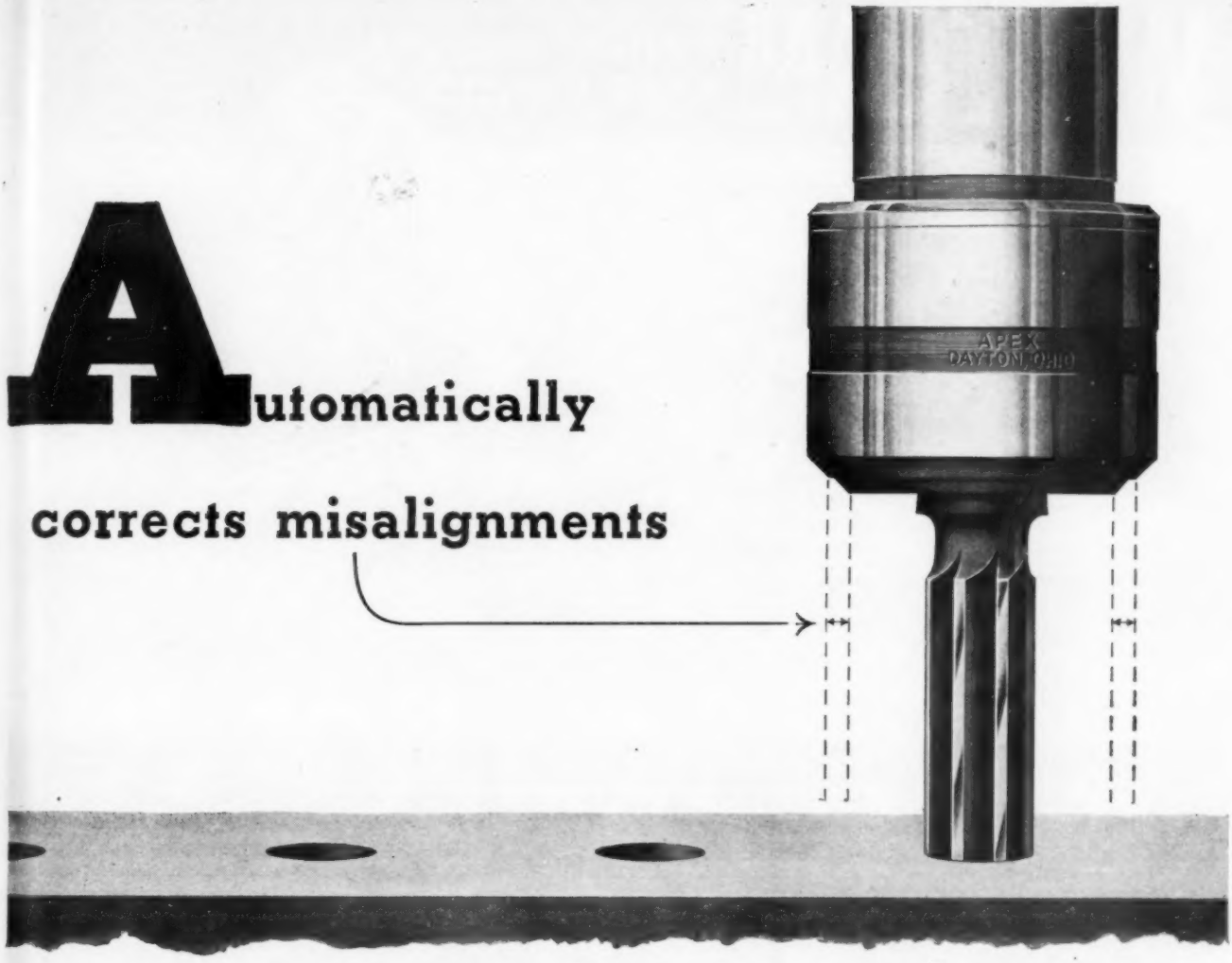
No. 1 SPUR and SPIRAL GEAR HOBBER (Illustrated) for work up to 6" dia.

Write for further details to

TRIPLEX MACHINE TOOL CORP.
Exclusive Sales Agents
125 Barclay St., New York, N. Y.

HAMILTON TOOL CO., *Builders*
Hamilton, O.

Automatically corrects misalignments

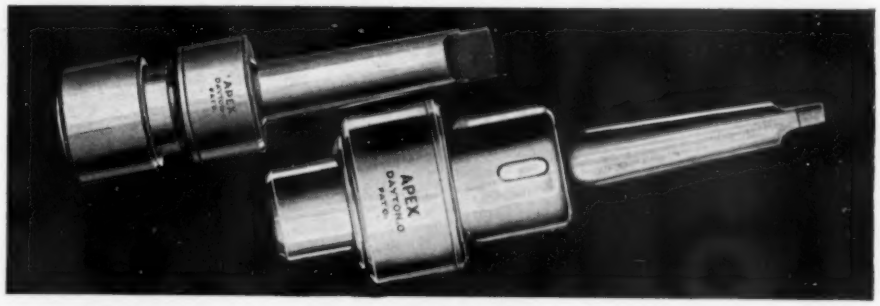


YOU GET *uniformly accurate* reamed, tapped or bored holes with Apex Floating Tool Holders. Why? Because the parallel floating action compensates for lateral misalignments between spindle and part. Patented ball drive practically eliminates all friction in the holder itself.

This holder prevents bell-mouthed and tapered holes.

The amount of float ranges from a few thousandths to 1/16". You can specify the amount of float required within the above ranges.

Shanks supplied for most requirements. Sockets may be had for Morse Taper or straight shank tools. These holders are also furnished with quick change chuck on bottom so a series of tools may be used. Made in two styles; one uses square type collets and the other uses quick change drill collets. Write for Catalog 14.



Chuck bottom type Extended socket type

APEX

THE APEX MACHINE & TOOL COMPANY, DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

WALTHAM PINION and GEAR CUTTERS

. . . for high speed production of fine pitch mechanisms

Small parts such as used in watches, instruments, time fuses, etc. can be produced in quantity and to closest accuracy on these easily handled machines. In all Waltham machines, the operation consists of a revolving cutter making successive cuts on blanks held and indexed by the work spindle and usually supported by a tail center. Only straight teeth can be cut. The following types of machines are available with either countershaft or individual motor drive:

SINGLE-CUT PINION MACHINES

Employs one cutter. Blank is positioned and machine started by hand. Other movements are automatic.

MULTIPLE-CUT PINION MACHINES

For use where second or third cut is necessary. These machines employ two or three cutters spaced on arbor of cutting spindle.

MAGAZINE-FED PINION MACHINES

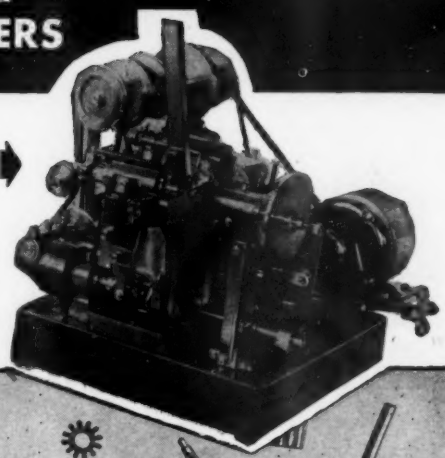
For continuous production of one kind of pinion. A fully automatic magazine fed machine (except for loading).

GEAR CUTTING MACHINES

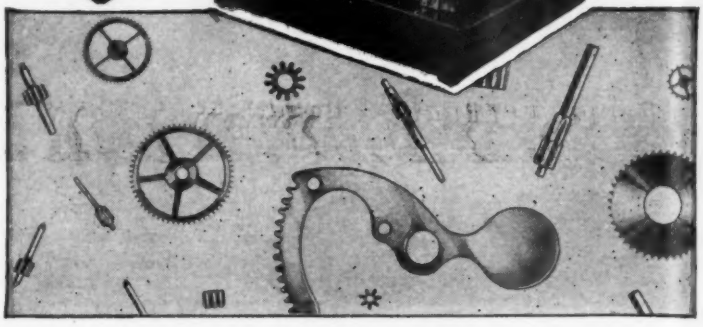
Single and Multiple-Cut Machines equipped with special cutter swing can be used to cut teeth on gears up to 1½" pitch diameter.

Complete specifications of Waltham Pinion and Gear Cutting Machines available on request.

Waltham Motor-drive Magazine-Feed Pinion Machine. Capacity (approx.) ½" diameter.



Typical work produced on Waltham Pinion and Gear Cutters.



WALTHAM MACHINE WORKS

WALTHAM MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

MOREY *Designed and Built FOR Precision PLUS Production*

VERTICAL SHAPERS 8"—12"—14" STROKES

Four cutting Speeds . . . infinite feed variations quickly selected . . . Directional control for all movements . . . Rapid power movements in all directions . . . Brake for Ram automatically applied...OPERATOR CONTROLS MACHINE WITHOUT MOVING FROM HIS WORKING POSITION . . . Timken Bearings for Bull Gear, Shaft and Rotary Table . . .

ACCURATE, POWERFUL, FAST, FINGERTIP CONTROL

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AIR and HYDRAULIC
Hanna Cylinders

Dependable power for pushing, pulling or lifting. Standard models, air or hydraulic, low or high pressure; for all requirements. Write for full details.

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Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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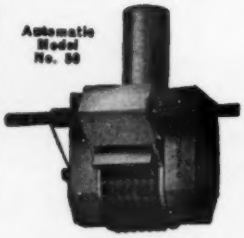
NUMBERALL Numbering Machines

For stamping into metal etc.

Automatic Model No. 50



non-automatic Model No. 70

Sturdy construction, precision build, perfectly aligned numbers.
All sizes of figures.

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NUMBERALL STAMP & TOOL CO., Inc.
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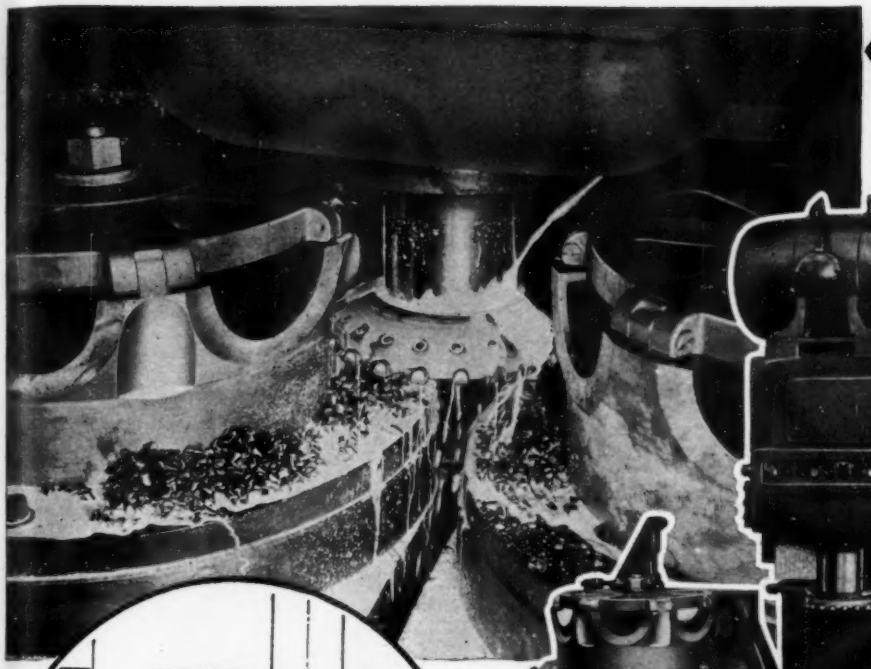
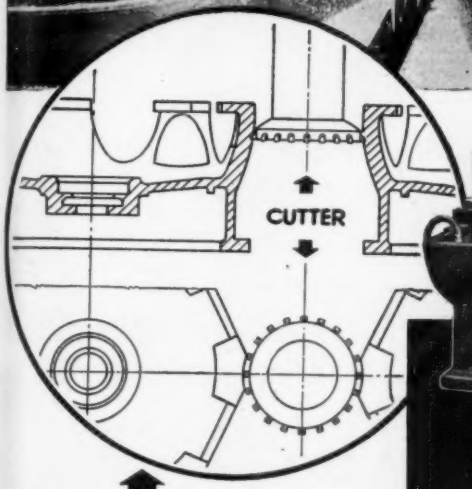


Two pieces of work are finished at the same time by using both sides of the cutter—a typical Cross development for conserving manpower, floor space, equipment and capital funds.

Cross developed and built this special machine to automatically mill crankcases for aircraft engines and thereby eliminate scrap, improve quality, increase production, reduce floor space and cost.



The downward feed of the cutter is synchronized with the inward feed of the work to produce a formed contour.

CONSERVE MAN POWER

WITH *Special Machinery*

Operating mechanisms are all built into the machine as integral self-contained units—well protected from pilfering and dirt.

Alert manufacturers are using more and more special machinery to maintain or increase production volume with a reduced labor force which often lacks skill or previous mechanical experience. Modern special machinery is accurate and automatic so the operator is only required to clamp the part and press an electric button—the machine does the work and to prescribed tolerances without further attention. Cross analyzes manufacturing problems, develops and builds special machinery to do better work and to do it faster with less labor.

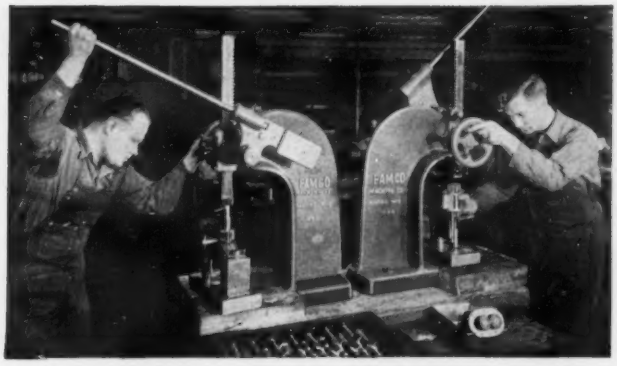
★ ★ CROSS MACHINE TOOLS ★ ★

CROSS GEAR & MACHINE CO. ★

Established in 1898

DETROIT, MICHIGAN, U.S.A.

S-6



. . . FOR PRECISION SPEED IN ASSEMBLY OPERATIONS

Illustrated above are two types of Famco Arbor Presses used for final assembly operations on marine fire pumps at the Evinrude Motors plant. Famco's exclusive adjustable gib control for front and side plate adjustment assures perfect ram alignment at all times . . . precision speed on every job. Write for facts on the complete Famco line.

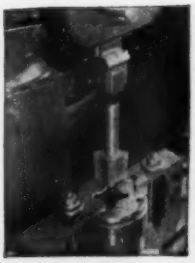
Floor Type Arbor Press

No. 15 Foot Press

FAMCO MACHINE COMPANY
1316 18th St. Racine, Wis.

Famco builds 32 stock sizes of bench and floor model Arbor Presses . . . ½ to 15 tons pressure; and 10 sizes of Foot Presses, bench and stand mounted types.

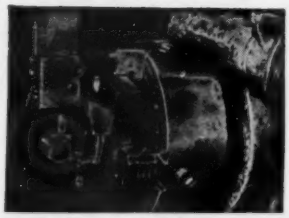
famco FOOT AND ARBOR PRESSES



4 *of the many ways* SLOTMASTER can be used to save TOOLS & SET-UPS

Left: Set-up for lapping deep impression die.

Below: Set-up for cutting an internal gear



SLOTMASTER can be used on any round or flat-on round over-arm milling machine and will do precision work that normally requires a multi-thousand dollar machine (all of the working parts are of tool steel, heat treated). It takes but little time to change over from one head to the other . . . the stroke of the ram is adjustable from 0 to 4" . . .the speeds range from 50 to 250 s.p.m. The tool holder is of the clapper box type and can be turned in any position. SLOTMASTER comes complete with pulleys, motor, mounting bracket etc.

Send for 4-page catalog—give specifications of the milling machines you wish to equip. Immediate deliveries on high priorities.

EXPERIMENTAL TOOL & DIE COMPANY
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Below: Conventional set-up on a round over-arm milling machine—thumbnail shows a set-up for cutting a spline

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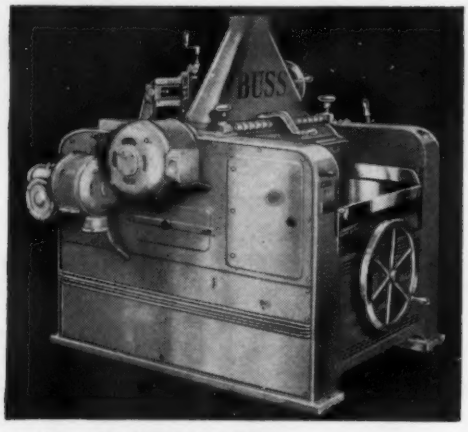
BUSS *Wood Surfacers*



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—plus faster change-over, greater convenience of operation and the assurance of years of perfect service. Write for Bulletins Type 4-L showing the many patented features which make this the finest of all surfacers for pattern and jig departments. Production Models to suit every circumstance. We specialize in surfacers.

BUSS MACHINE WORKS
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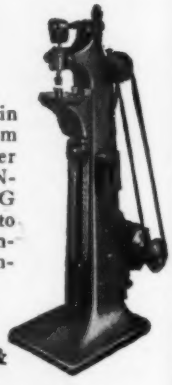

RIVETERS—PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
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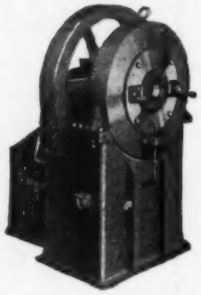

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TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
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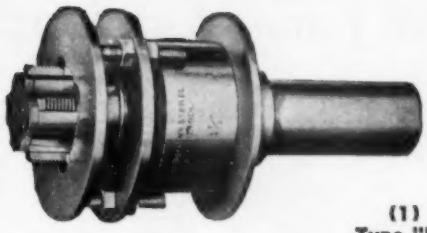
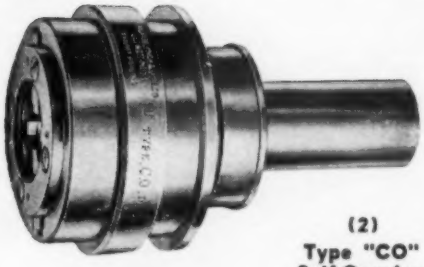
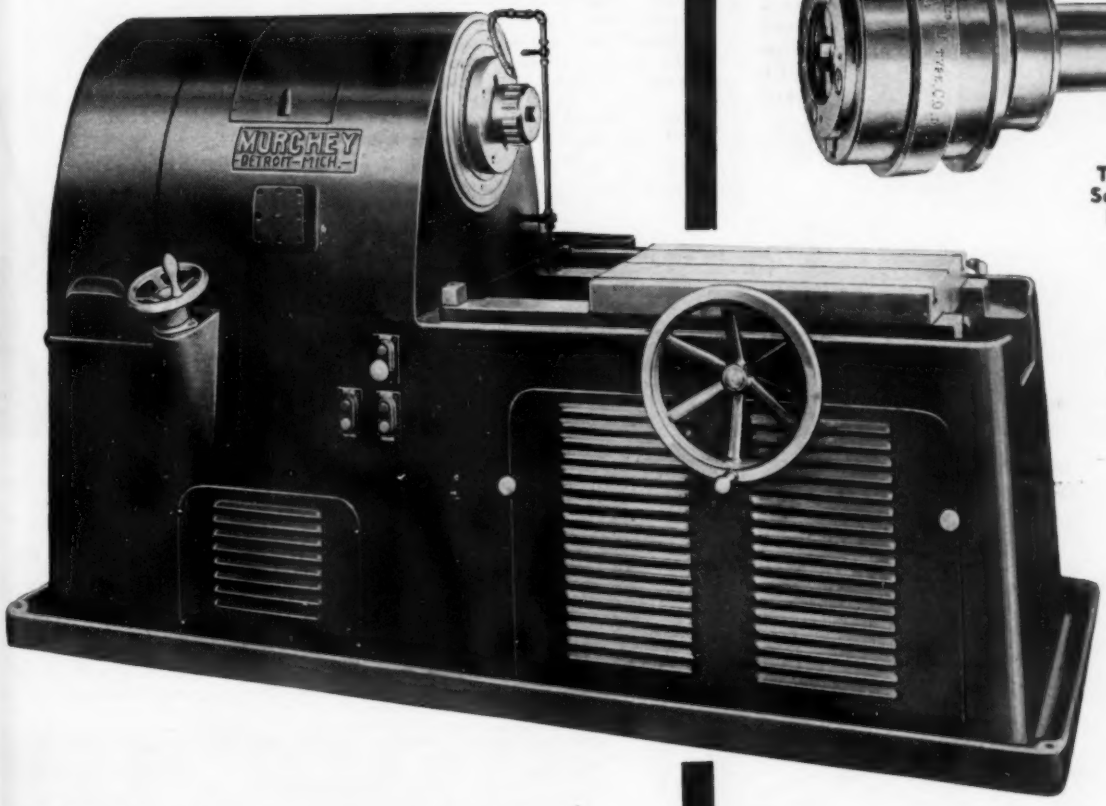
. . . . . for threading to extra accuracy at extra speed . . .



(1)
Type "M"
Collapsible
Tap



(2)
Type "CO"
Self-Opening
Die Head



Every threading job is an opportunity for faster, better work with Murchey Threading Equipment.

Internal or external threads from 1" to 4" in diameter on the #32 Murchey Thread Milling Machine and larger threads from 4" to 12" diameter on the #42 Machine (shown) can be cut on a mass production basis, accurately and with precision concentricity.

Maximum efficiency in operation results from a completely hydraulic work cycle and a variable speed drive which permit the selection of the right speed and feed for each job.

Murchey thread production equipment will give you high quantity thread production to close tolerances. Investigate.

Murchey also manufacturers all types of Collapsible Taps, Self-Opening Die Heads and Shell Tapping Machines.

. . . use MURCHEY EQUIPMENT

Delivery—
FOUR WEEKS

MURCHEY MACHINE & TOOL COMPANY
DETROIT MICHIGAN

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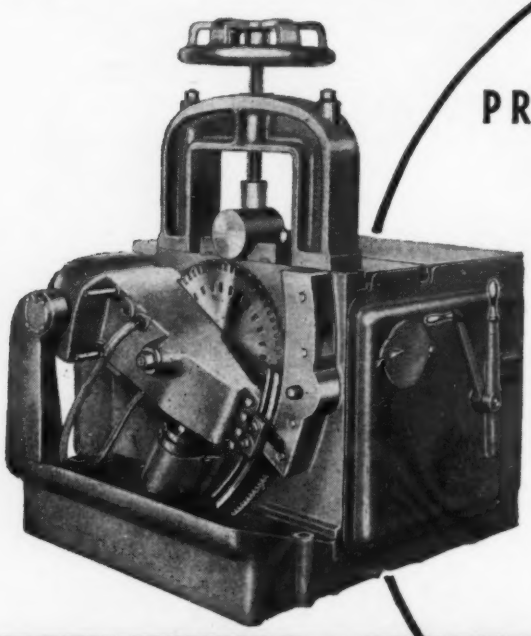

with the PORTER-McLEOD PRODUCTION Cutting-Off Machine

This new 8" machine will step-up production and make such big returns in time and money savings in cutting stock for 3 inches up as to quickly return its first cost.

Here's the machine to break bottlenecks in cold metal sawing—a machine that's versatile, fast, powerful and accurate, yet easy to control and economical to operate. You can put it to work on single pieces or by nesting of bars or shapes, handle multiple unit cutting up to the capacity of the machine.

The outstanding speed of this machine is made possible by features which protect blade and work and save power. For example, due to the leverage exerted on the blade, which is supported close to its rim and pulled through the cut, buckling of the saw is prevented and accuracy as well as straight cuts assured. Friction feed insures against blade breakage.

The standard feed of this machine is 3 inches and this can be stepped up for brass and non-ferrous metals.

Get all the facts about this new production machine by writing today for illustrated bulletin.

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MACHINE TOOL COMPANY

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NOTE ALTERNATE SINGLE AND DOUBLE CHIPS
Triple-Chip METHOD OF COLD SAWING METAL
DOES More WORK Faster!

Good, clean, accurate work, too—the only kind you can afford to do for Uncle Sam or anybody else. Clean cutting without chatter, without burrs, without scrap. Production up to 1-1/2 times previous highs. Two machines (No. 3 and No. 4) handle round stock up to 16", squares to 14-1/2"; single or multiple cutting of practically any metal, ferrous or non-ferrous. Only Motch & Merryweather builds all 3: cold saw, blade, and blade sharpener. Bulletin.

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LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permit normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY

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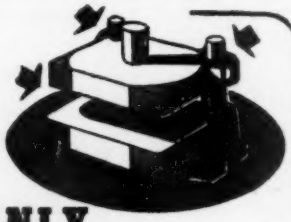

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Means Greater Accuracy In Your Production
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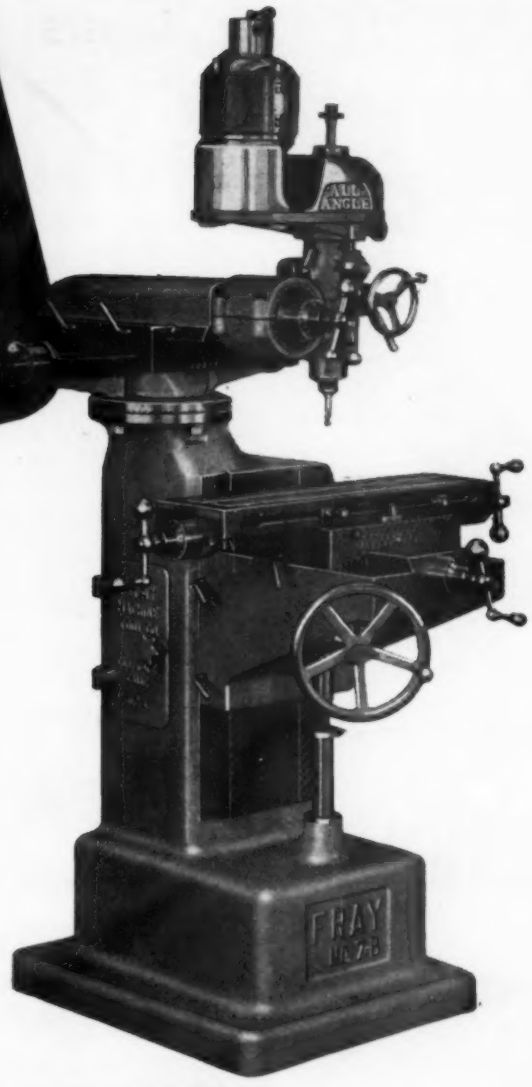
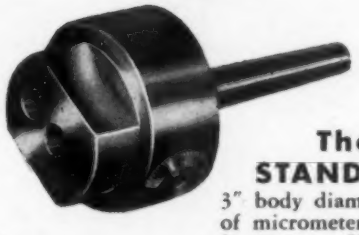


RAM TYPE No. 7-B
Vertical Universal Milling Machine

Without changing the work set-up, machining operations can be done at any angle in either or both the vertical and horizontal planes. All movements of the head are accurately controlled with calibrated dials. The maximum of flexibility desired by tool makers is a feature of the Fray No. 7-B Machine.

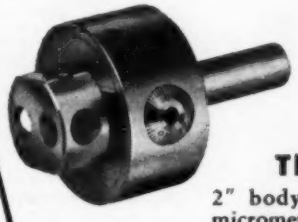
MICROMETER OFFSET BORING HEADS

Hundreds of firms now have Fray Boring Heads in their tool cribs for FAST, PRECISION WORK. Time is saved and guess work eliminated with the calibrated off-set adjustment dial. Three tool holes provide wide flexibility of service, with only two boring bars. Exclusive design maintains accuracy.



The STANDARD

3" body diameter... ½" of micrometer offset adjustment... dial set flush with 50 graduations of .001" each... shank tapered and tapped for draw-in bolt... No. 7 Brown & Sharpe or No. 2 Morse taper arbors standard (special arbors furnished on request)... two ½" boring bars furnished with Head.



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2" body diameter... 5/16" of micrometer offset adjustment... dial calibrated in .001"... straight shank... two ⅜" boring bars furnished with Head.

Users of FRAY Milling Machines and All-Angle Milling Attachments are ASSURED of a dependable source of End Mills, through the Fray Tool & Reamer Co. All standard types and sizes.

FRAY MACHINE TOOL CO., INC.

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Manufacturers of: *All-Angle Milling Attachments, Milling Machines, Offset Boring Heads and Boring Bars.*

Subsidiaries: FRAYCO ELECTRIC MOTORS CO., FRAY TOOL & REAMER CO

For rapid gaging of
INSIDE DIMENSIONS
with
split-thousandth
accuracy

THE TRICO MICRO-CHEK is now in use in more than 2250 war plants to speed up nearly all types of precision gaging. Multiplies dimensions by 200—reducing eyestrain and fatigue.

The new Caliper Type facilitates rapid gaging of internal dimensions, regardless of shape—from 3/16" to 2-1/2"—by means of expanding caliper fingers. Set up ready for use. Applicable to practically any recessed gaging need—replacing plug gages. Adjustable against wear.

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Write for illustrated booklet showing many applications of Micro-Cheks.

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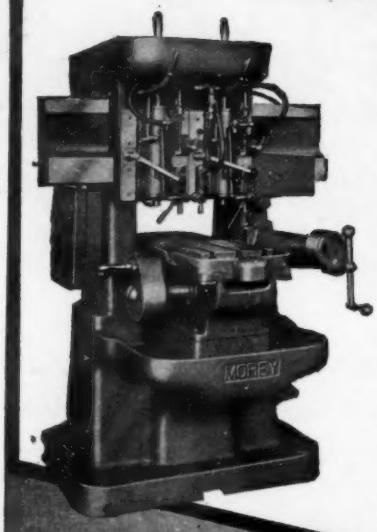
MOREY
DESIGNED AND BUILT
For PRECISION PLUS PRODUCTION

MOREY VERTICAL PROFILER
AND MILLING MACHINE



Over 2000 Morey Profilers in continuous service assuring speedy production for the United Nations in duplicating small parts.

Cross head is balanced on vibration-free cross rail . . . Clearance between spindle and table easily increased or decreased . . . Spindles mounted on precision bearings . . . Ball bearings throughout . . . Slides ride on scraped ways and are adjustable against future wear.

Ample provision for lubrication . . . Simple adjustment takes up backlash . . . No chatter marks on work . . . Table working surface, 12¾" x 15"

Ask for Circular No. 680A

MOREY MACHINERY CO., INC
410 Broome Street New York, N. Y.

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WHERE *Accuracy Is Vital*

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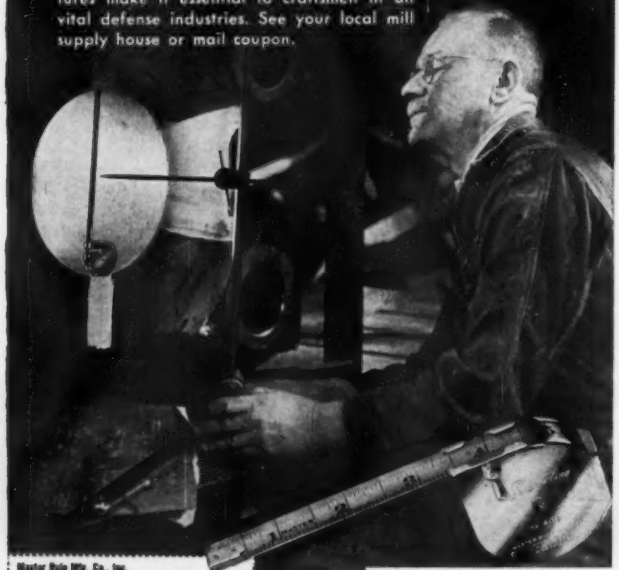

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Please send me 6-ft. "Streamline" Steel Tape Rule complete with Spare Blade. (Enclosed $2.65 Check or M. O.)
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WOOD AND TAPE RULES

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TWO *BEST BETS!*

SIMMONS No. 2 TURRET LATHE

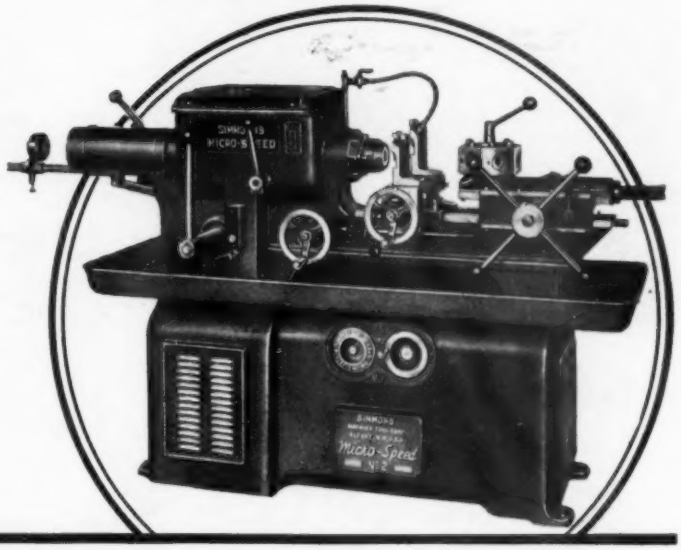
Recently the editor of a leading metal-working publication specializing in screw machine operation visited a plant employing several batteries of Simmons No. 2 *MICRO-SPEED* Turret Lathes. "We were amazed," he wrote, "at the number of diversified parts that were being turned out on these machines with very little special tooling items in use. In fact, many of the turret lathes did not have what could be termed a 'special tool' in their entire set-up."

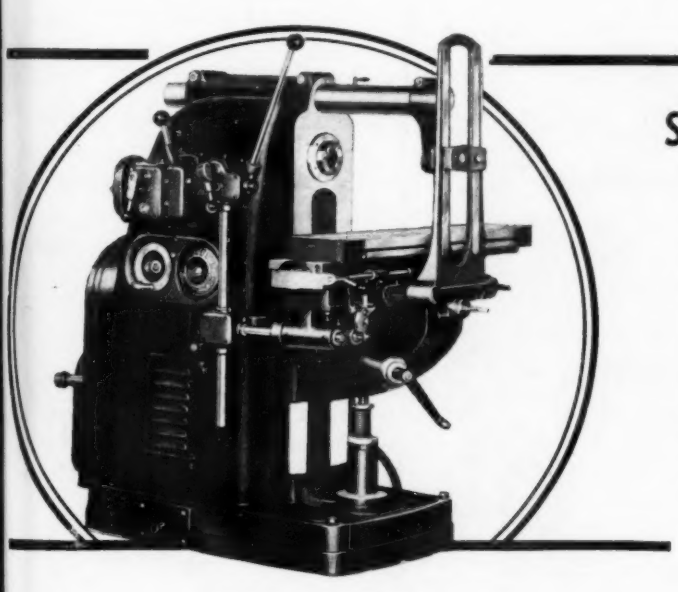
Therefore, whether your plant has converted to war work or continues to make standard products, Simmons Turret Lathes will prove a production standby. They produce close-tolerance work speedily and economically. The MICRO-SPEED Drive offers unlimited speed variations and all changes can be made while the spindle is in operation. This enables quick selection of the speed best-suited to the work and cutting tools. *Ask TODAY for full details and delivery dates.*

SPECIFICATIONS

Bar Capacity—1¼"; Swing over bed—14";
Swing over cross-slide—6".
Made in Plain and Back-geared types
(latter shown in illustration)

- MICRO-SPEED DRIVE
- SELECTOR DIAL CONTROL
- SPINDLE BRAKE & CLUTCH





SIMMONS No. 1A MILLING MACHINE

Because inexperienced operators learn to produce small, high-precision parts quickly, Simmons No. 1A Micro-Millers will help solve your skilled-labor shortage. These sturdy, versatile milling machines are equally efficient on long production runs or small-lot work requiring frequent set-ups.

Through *MICRO-SPEED*, a unitized A.C. motor and variable speed drive mounted on a hinged bracket in the column, spindle speed changes are made while the spindle is in operation. A direct-reading index plate shows the speed obtainable at each position of the Selector Dial. Thus the operator can easily determine the spindle speed best suited to the work and cutting tools. *Write TODAY for full details and delivery dates.*

- MICRO-SPEED DRIVE
- SELECTOR DIAL CONTROL
- SPINDLE BRAKE & CLUTCH

SPECIFICATIONS

SPEEDS: 56-630 R.P.M.
RANGE OF FEEDS: Horizontal, 34"; Cross, 8";
Vertical, 18½"

SIMMONS MACHINE TOOL CORPORATION

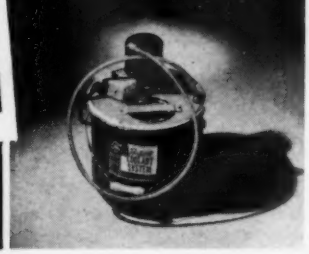
Main Office: 1759 NORTH BROADWAY, ALBANY, N. Y. *New York Office:* 149 BROADWAY

SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES

Use *coolants* on *all* your machines...

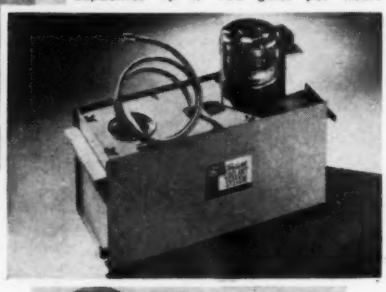
...TO SAVE TIME—TOOLS AND INCREASE PRODUCTION



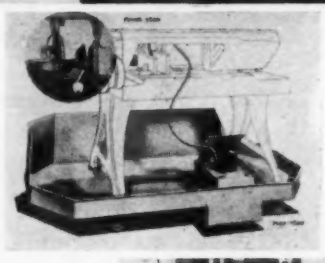
Above: Standard Model—capacities up to 130 gals. per hour.

Left: Model H-10A Centrifugal — capacities 10 to 1,000 gals. per hour.

Below: Heavy Duty "A" Series Model—capacities up to 165 gals. per hour.



GRAY-MILLS *Portable* COOLANT SYSTEMS



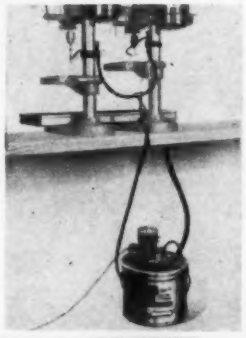
HERE is the simple, economical way to equip your machines to use coolants —to help them produce more and better work—faster! Gray-Mills Systems have increased the efficiency of hundreds of machines on operations like drilling, milling, sawing, grinding, honing, tapping, threading and cutting. They are quickly and easily set up to operate either as a permanent or temporary part of a tool. Sturdily built Gray-Mills Systems are available in both gear and centrifugal types with capacities from 50 to 1,000-gals. per hour—controlled flow. Prices range from $39.50 to $189.50.

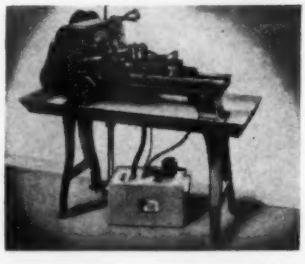
If you want to modernize your older machines — equip small, large or special tools for greater efficiency — or have a "standby" and "clean out" system there is a Gray-Mills for the job. Call your distributor or write direct.

Above: Model S-20 system for horizontal band saws.

Right: Standard model serving 2 drill presses.

Below: "A" series model on a bench lathe.





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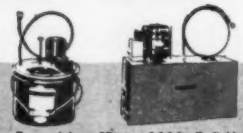

Capacities 50 to 1000 G.P.H. Pressures 8 to 150 lbs.

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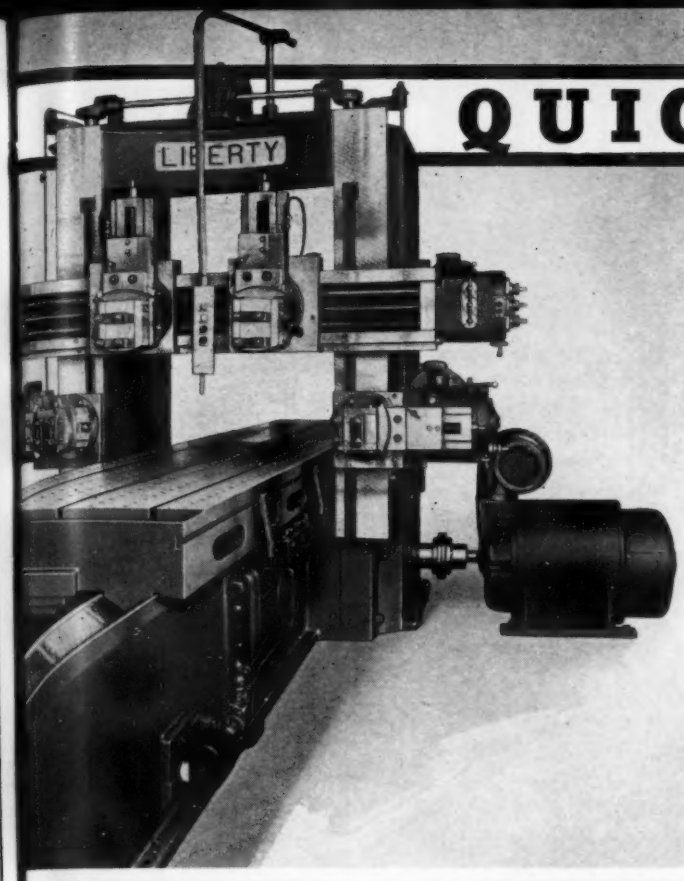

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MEDIUM DUTY
PLANERS
48"x48" Double Housing

Here is a sturdy, rugged machine designed and developed for efficient, economical operation on medium class planer work.

● These are just a few of the important features this Liberty has which provide you with high accurate production.

Box type table with "T" slots machined from solid extra heavy box type housings, bolted and doweled to bed.

Sturdy cross brace at top assures sustained rigidity. Deep box type cross rail individually motorized for elevating.

Friction feed and rapid traversing mechanisms for rail head are immersed in oil—located at end of rail along with simplified control.

Rail heads are provided with automatic pneumatic tool lifters.

Side heads may be moved below table level when not in use.

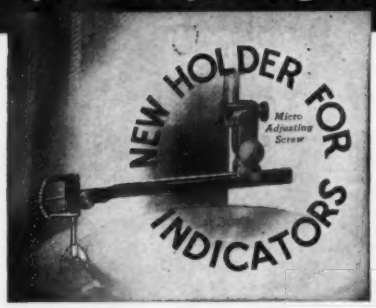
Driven by 30 H.P. DC variable voltage reversing motor, 40 to 1200 R.P.M. Generator set and controls operation 3 phase, 60 cycle 220 or 440 Volt current. Table feeds range from 6 to 172 F.P.M.

New Liberty Catalog #155 fully illustrates and describes this 48" Double Housing Planer. Your copy mailed upon request.

LIBERTY PLANERS

1006 WELLER AVENUE HAMILTON • OHIO

Save 60% TIME spent adjusting indicators



For Jigborers, Boring Mills, Milling Machines. It fits all popular indicators. The above illustration shown complete with extension bar.

NO more tiresome tapping your indicator into position. Now — after locking to approximate position, you obtain final setting by simply turning Micro Adjusting Screw. This exclusive, time-saving feature of the OSLUND HOLDER for all popular indicators gives you ***complete control.*** Write today for details.

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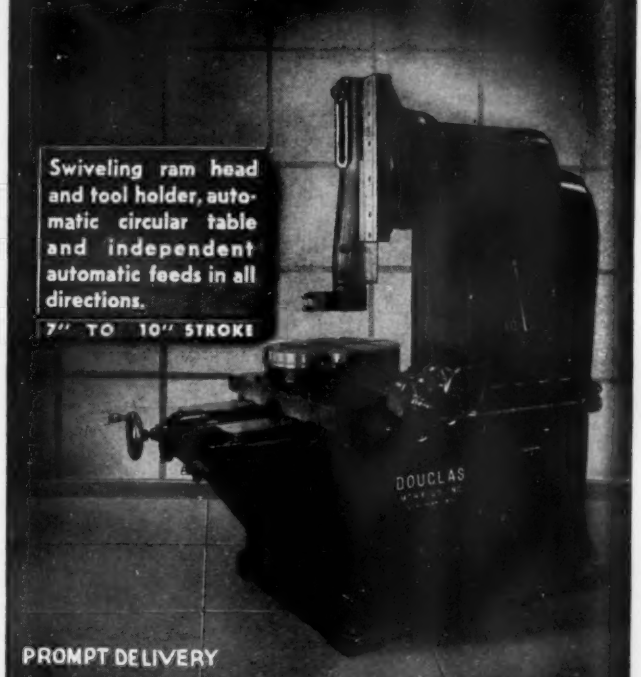
Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.
7" TO 10" STROKE
DOUGLAS

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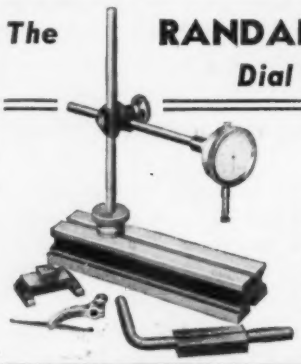
The RANDALL & STICKNEY *Dial Test Indicator*



A valuable instrument for erectors and inspectors

Especially convenient for checking accuracy in surfaces and spindle movements; also for obtaining comparative measurements on close work and for lining up work on machine tools.

Horizontal arm adjustable and can be removed for independent use. With blocks fitted into T slot of base, this R&S indicator can be used against edge of surface plate for checking accuracy of long horizontal surfaces. Dial diameter 2⅛"; base 8½x2¼".

Complete details on request.

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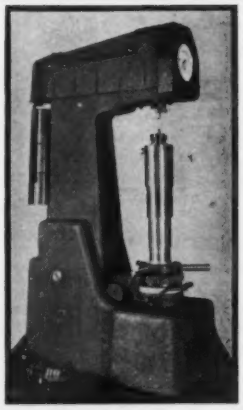

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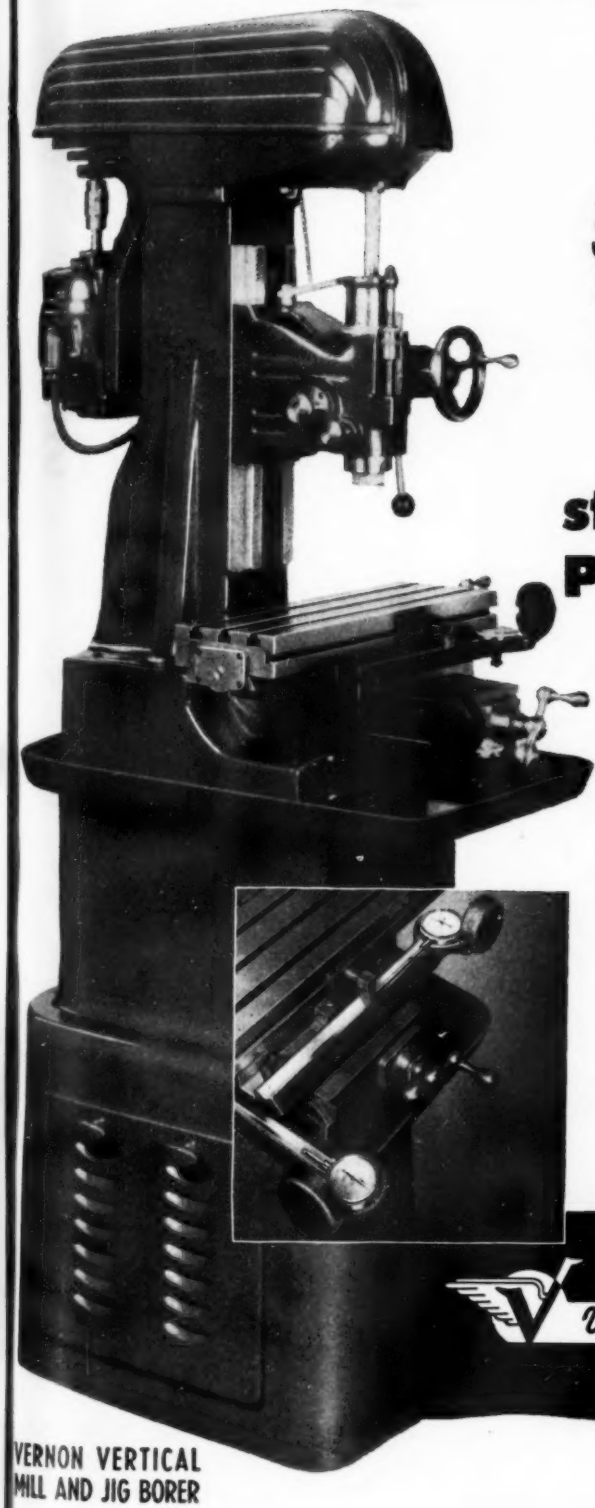
This Vernon can be purchased through any of our 70 distributors. Write for our latest bulletins.

Dial gauges and measuring rods are available as standard extras for accurately reading table linear movements. Large dial graduations permit visual splitting of thousandths; and measuring rods eliminate all error due to lead screw wear.



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MACHINERY MANUFACTURING COMPANY
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ACTUAL PHOTOGRAPH
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a steel knot

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7. High Case Hardness
8. Great Core Toughness
9. Reduced Carburizing Time
10. Unusual Ductility
11. Minimum Distortion

SPEED CASE STEEL *CARBURIZES* in less time with *HIGH CASE HARDNESS . . . CORE TOUGHNESS* and *MINIMUM DISTORTION.*

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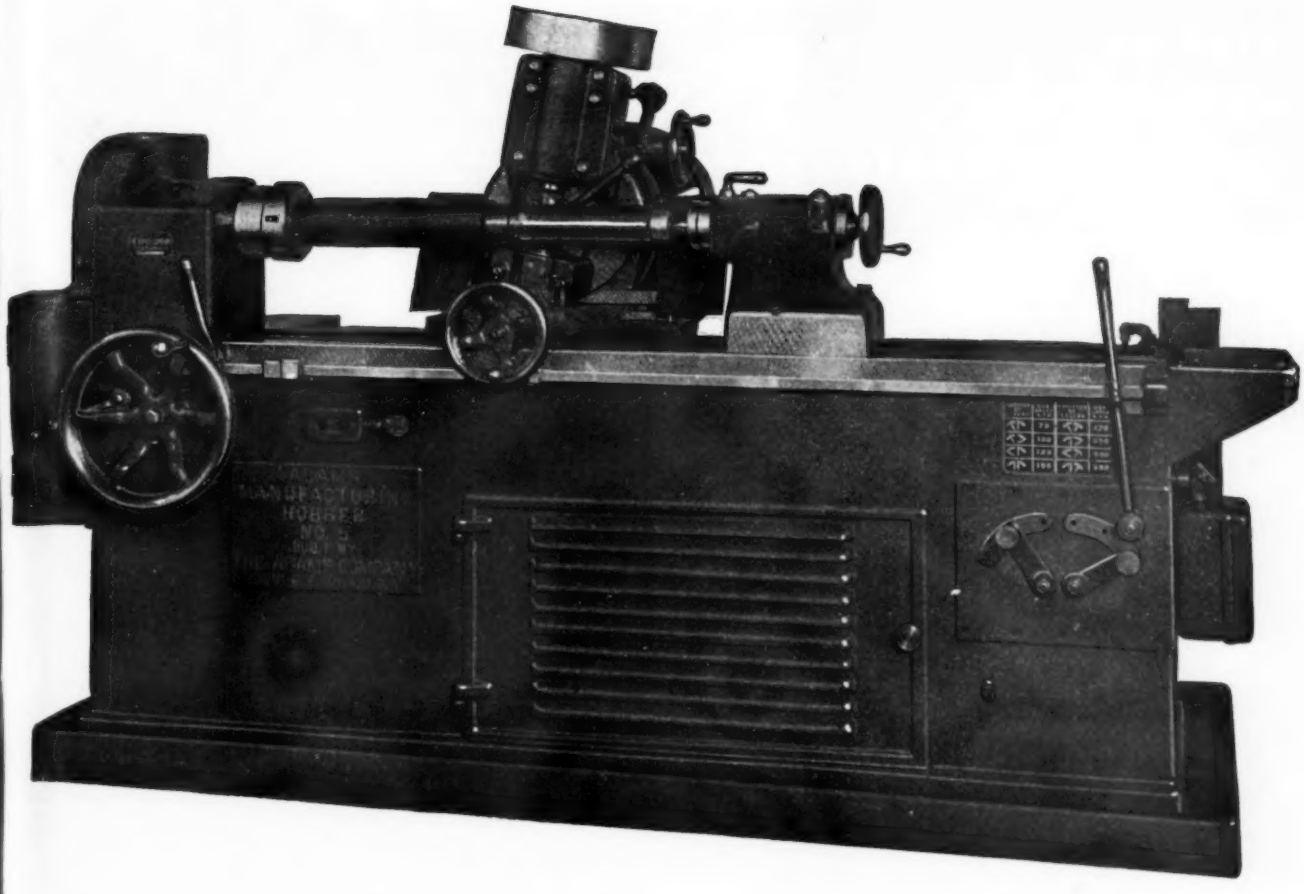
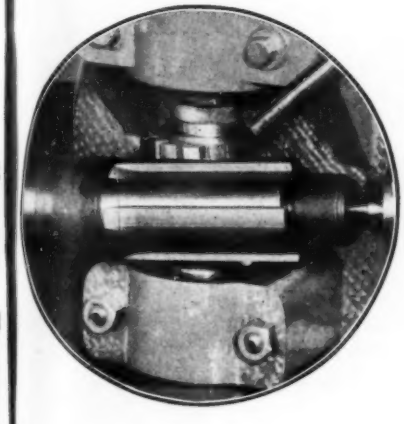


High Productive Capacity

on Spur Gears and Splines—

The Adams Manufacturing Hobber



Outstanding features include:

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2. Simple setups, and accessibility of work and controls.
3. Anti-friction bearings at all vital points.
4. Filtered lubricant pumped to main bearings, with splash lubrication for carriage mechanism.
5. Filter on coolant line adds to hob life and assures smoother work.

Capacity: No. 5M—8" diameter, 48" between centers; No. 6M—8" diameter, 24" between centers. If your work includes helical gears, worms or screws, ask for information on the Adams Gear Hobber & Thread Miller.

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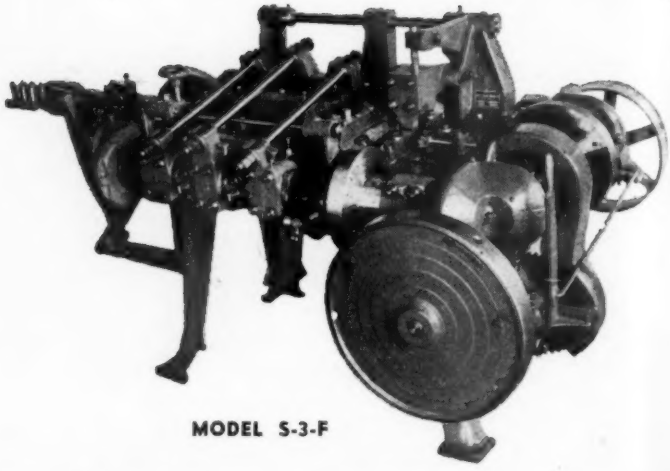
. . . with the

NILSON AUTOMATIC METAL and WIRE FORMING MACHINES



MODEL S-3-F

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. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

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WAR BONDS *are* WAR WEAPONS

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BAUMBACH STANDARDIZED DIE SETS

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Machined Steel Semi-Steel
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DI-ACRO Shear squares and sizes material, cuts strips, slits, notches.

BRAKES
DI-ACRO Brake forms non-stock angles, channels or "Vees".

BENDERS
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No delay waiting for dies — parts ready quicker — deliveries speeded up — all to bring the Victory sooner! Women are rapidly taking a major place on the industrial front. DI-ACRO Precision Machines—Shears, Brakes, Benders—are ideally suited for use by women in making duplicated parts accurate to .001" — DIE-LESS DUPLICATING. Thousands of DI-ACRO Machines are now in use in War plants. Get the whole story.

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Federal Presses are performing many highly specialized jobs in hundreds of plants throughout America to speed sorely needed war equipment. Primary, secondary, and assembly operations are accomplished quickly, safely, and precisely, often eliminating the need for specialized machinery of limited utility. Write for help with your press problems.

Special Applications

Federal Open-Back, Inclinable Presses may be equipped with automatic feed and ejector mechanisms, and automatic stops. Standard models of either geared or flywheel type are available in 9 sizes with capacities from 6 to 80 tons, with or without dial feeds.

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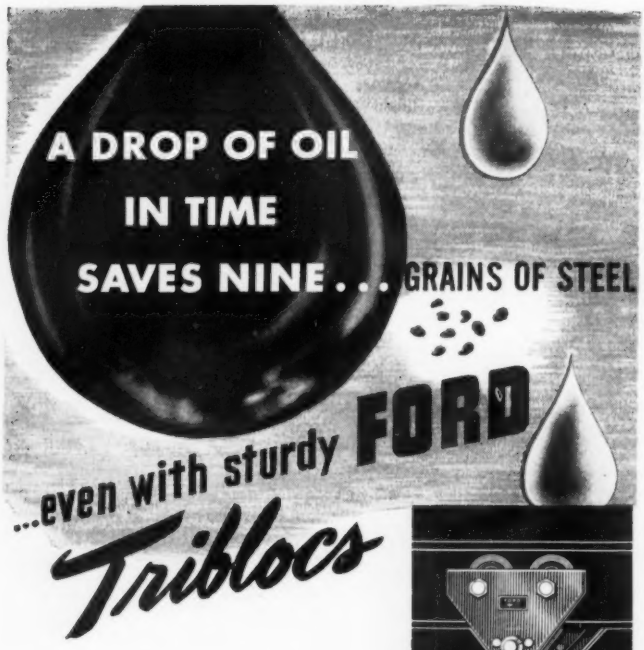
THE FEDERAL PRESS CO., 305 DIVISION STREET, ELKHART, INDIANA



...even with sturdy FORD Triblocs

This is no time to let machinery run dry. Proper maintenance means proper lubrication. Yes, lubrication is an all-important factor in making present equipment last longer. So, here are just a few suggestions for keeping your FORD TRIBLOCS in efficient working order:

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- Load sheaves should also be greased.
- Oil bearings frequently to avoid needless and excessive wear.
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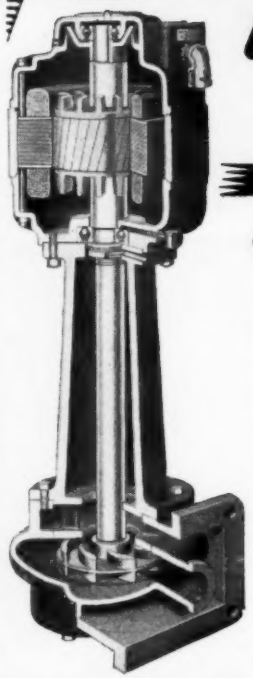
GUSHER COOLANT PUMPS



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Write for data and specifications.

This is an internal discharge type. No outside piping necessary.

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

For Employee Training

"THE TOOLS OF OUR TRADE"

American Machinist's 16-page special section on elementary shop practice now available in reprint form.

Production executives will find in this exactly the type of information needed by new workers. Removes the chief obstacle to the novice's progress—the simple fact that he doesn't know the names of things. Covers measuring, gaging, marking, holding, cutting, forming and milling tools. Basic instruction data which will save you months of preparation time.

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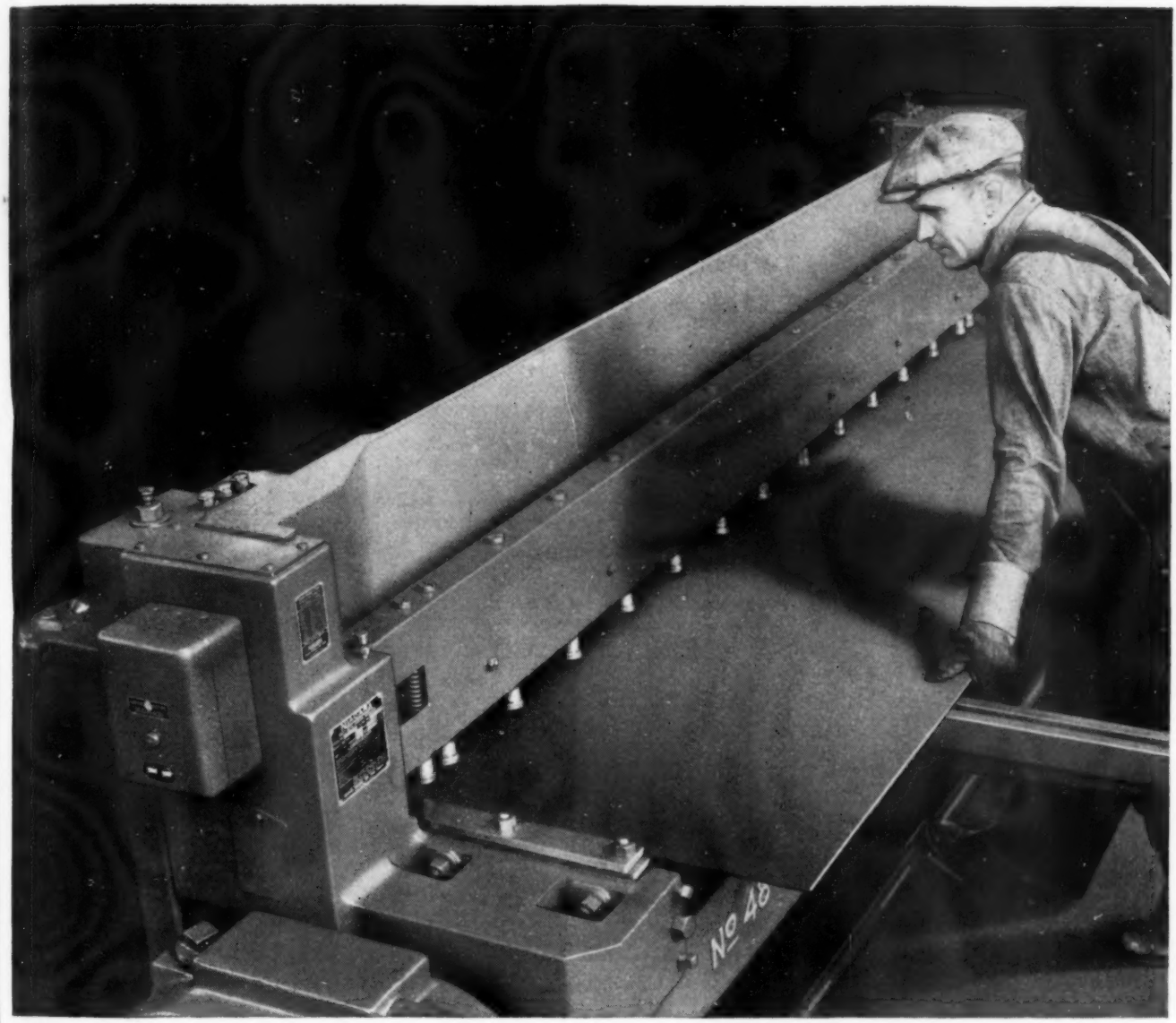

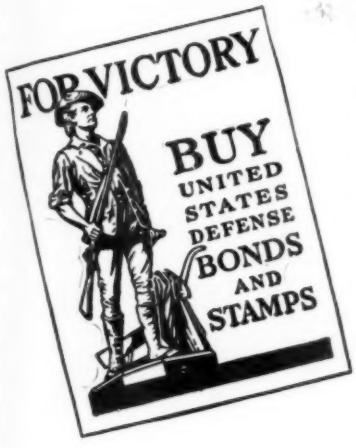

● War plants throughout America are obtaining more production per man hour wherever sheet metal must be squared, trimmed or cut into strips. The above photograph gives an "operator's eye view" of one of the latest type Niagara Power Squaring Shears. The entire machine is arranged for convenient operation, quick accurate setting of ball bearing, self-measuring, parallel back gage, full visibility of cutting line and many other features which speed up shearing. Niagara Power Squaring Shears are built in a complete range of sizes and capacities.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

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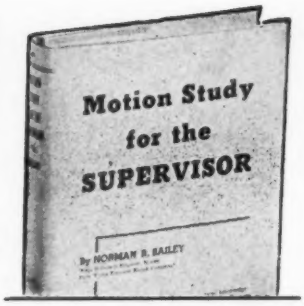
How to stop waste motion and speed up production



This book gives a simplified, practical method of motion study for analyzing operations quickly and easily, enabling the foreman to employ motion study as a useful, everyday tool in speeding production and increasing output in his department. It shows how to detect wasted effort in operations, how to recognize the cause of ineffective work, and how to develop better job methods.

MOTION STUDY for the SUPERVISOR

By Norman R. Bailey

Wage Standards Engineer, Kodak Park Works, Eastman Kodak Co.

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Now the foreman or supervisor may use motion study as easily as any everyday management process. With only a stop-watch and a simple, basic "formula", he can analyze any operation for improvement. Even operations to which it formerly was unprofitable to apply motion study may be analyzed by the simplified methods explained in this book. Here is a practical means of eliminating ineffective work and of spotting opportunities for methods improvement, with worthwhile cumulative benefits in greater production per hour.

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—how to time an operation

—how to identify useful or wasted effort

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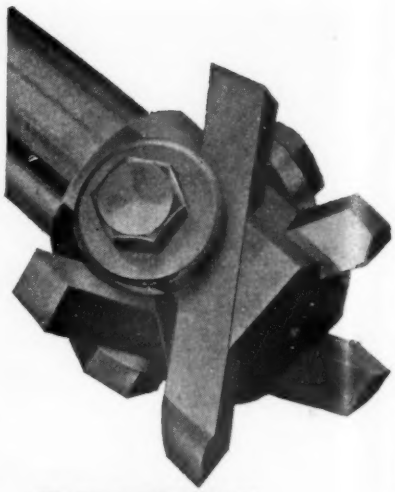

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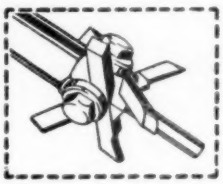

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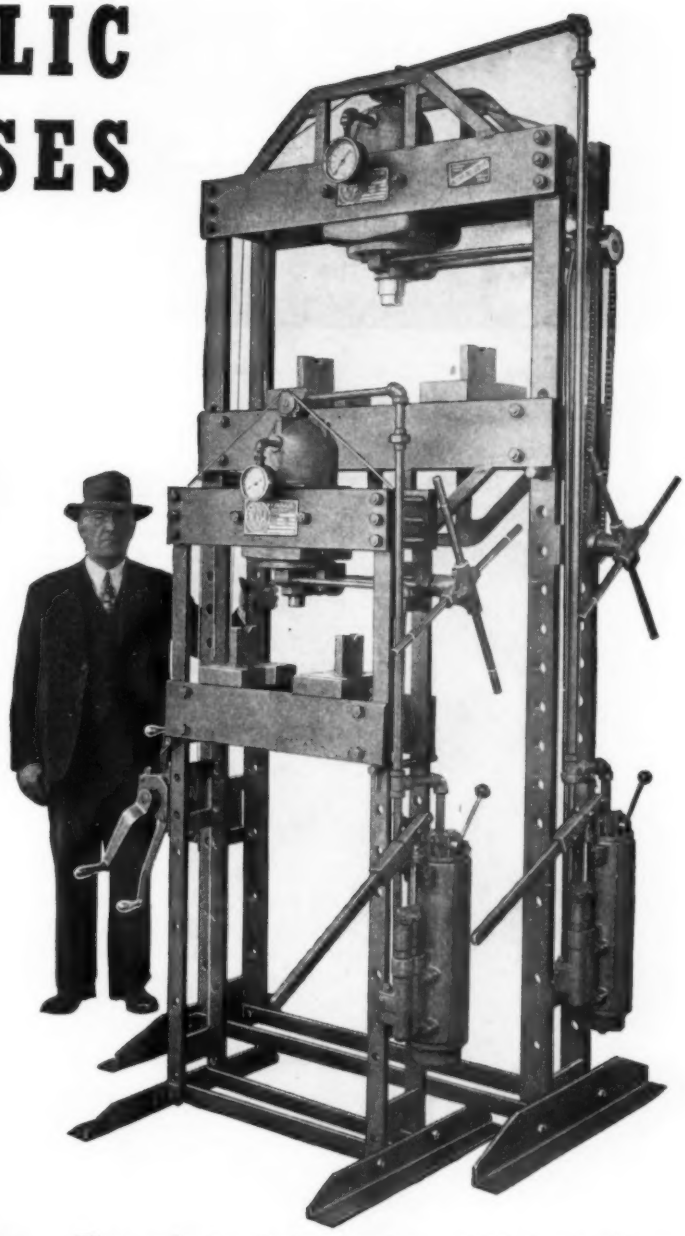

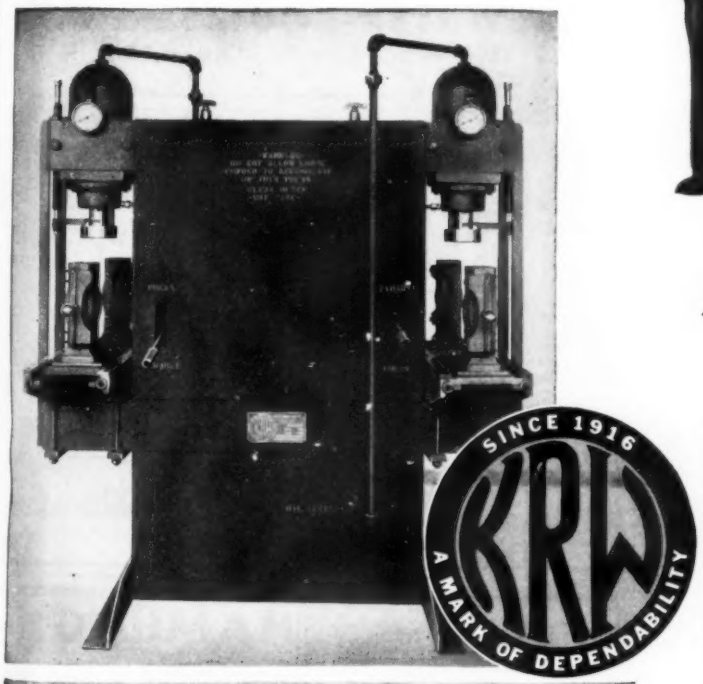

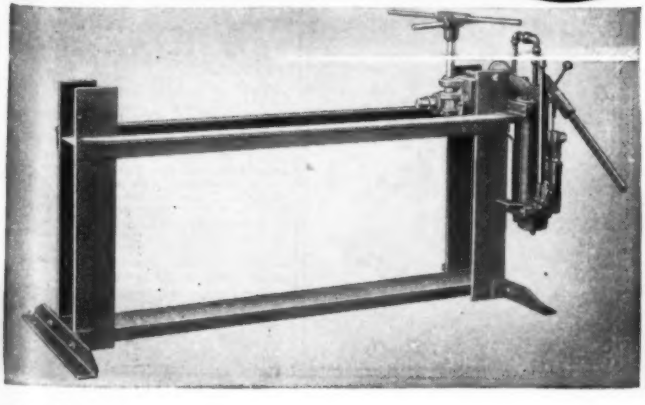

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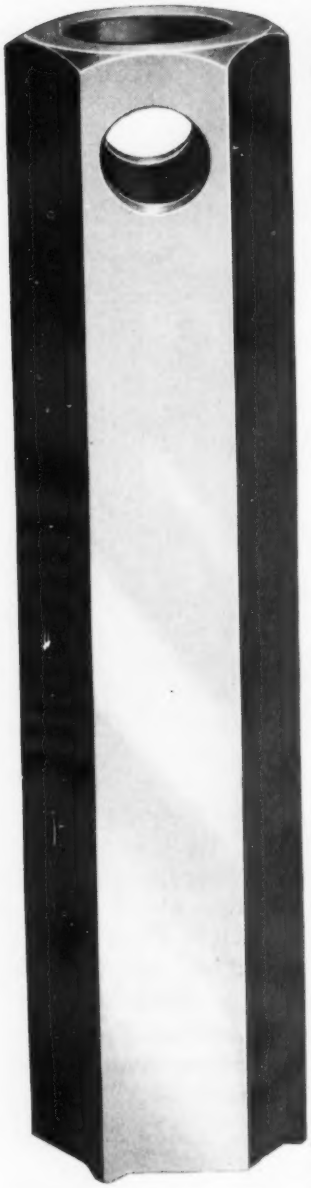

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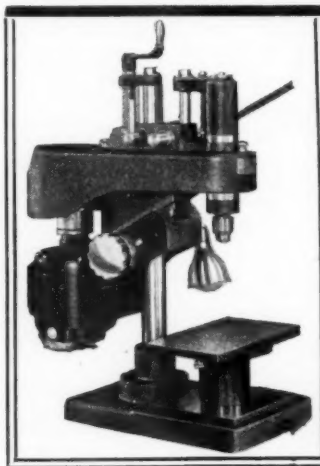

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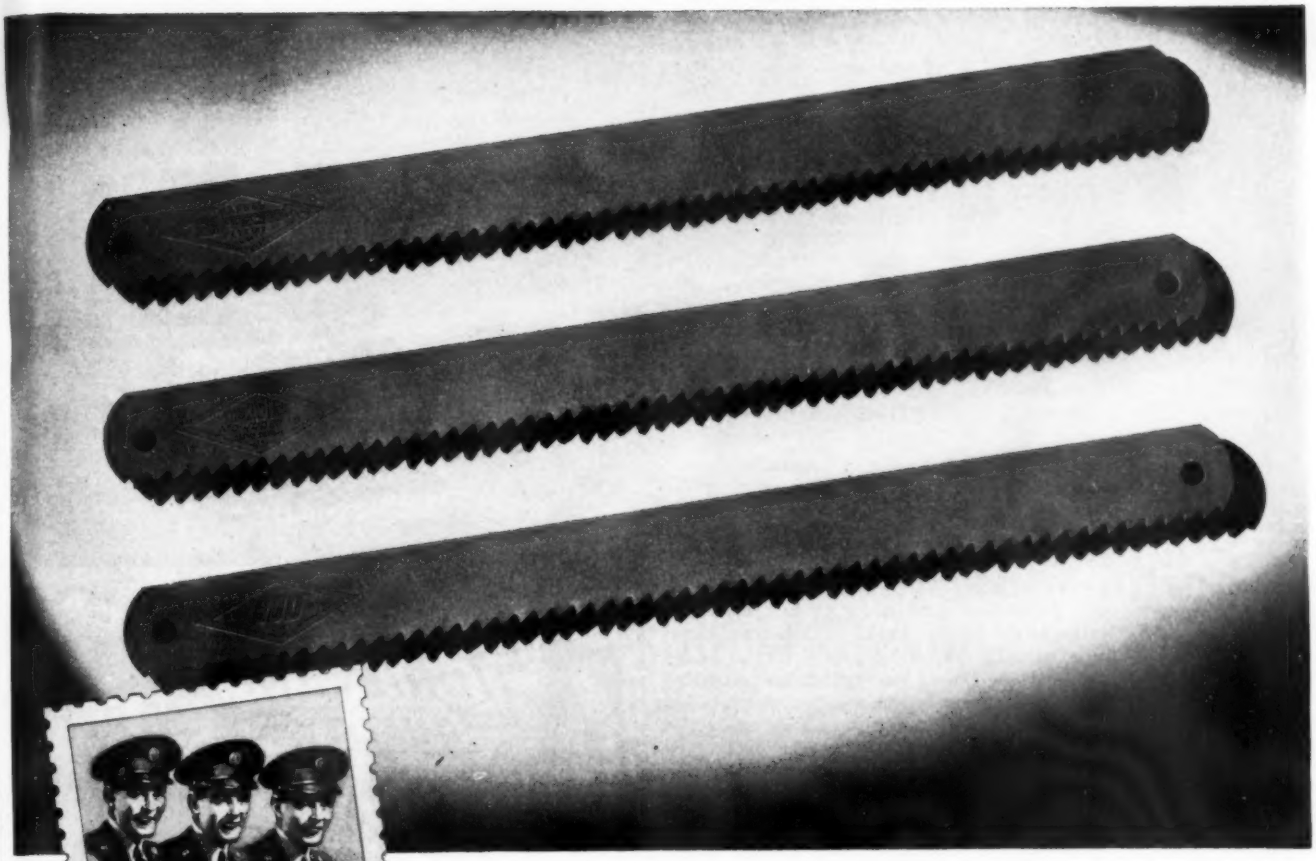

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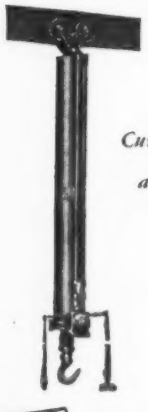

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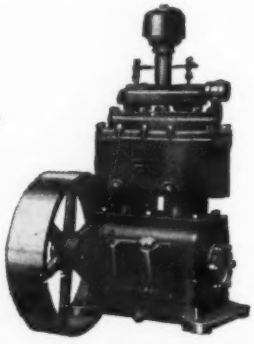

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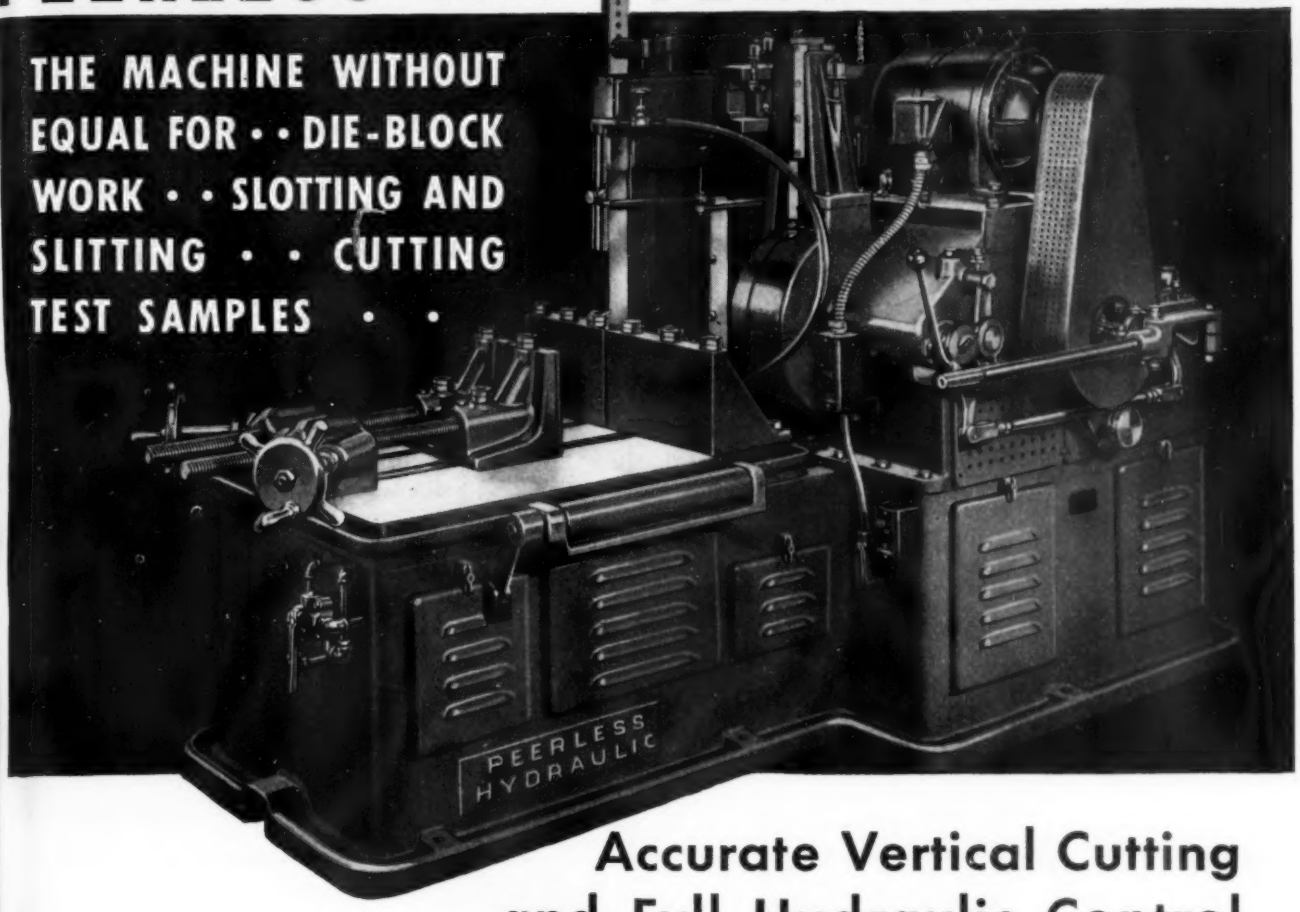

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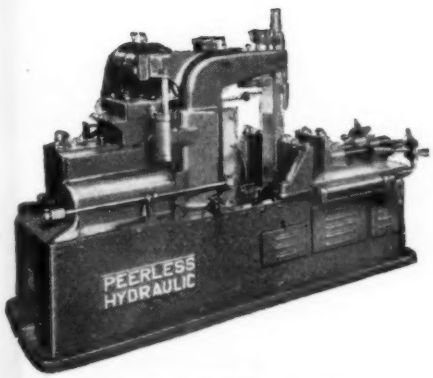

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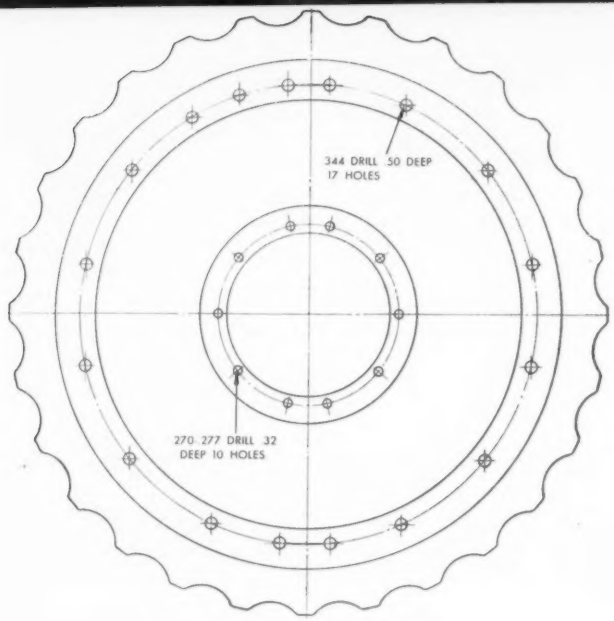

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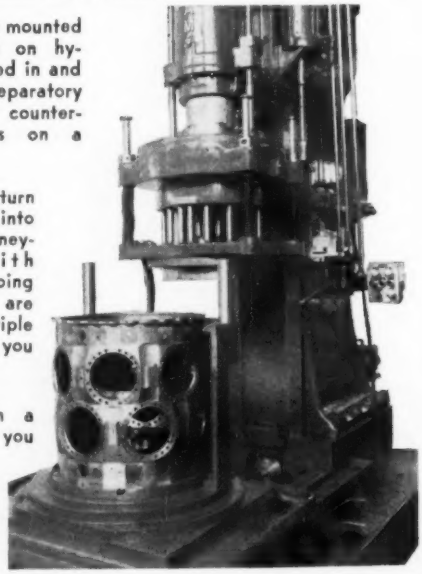

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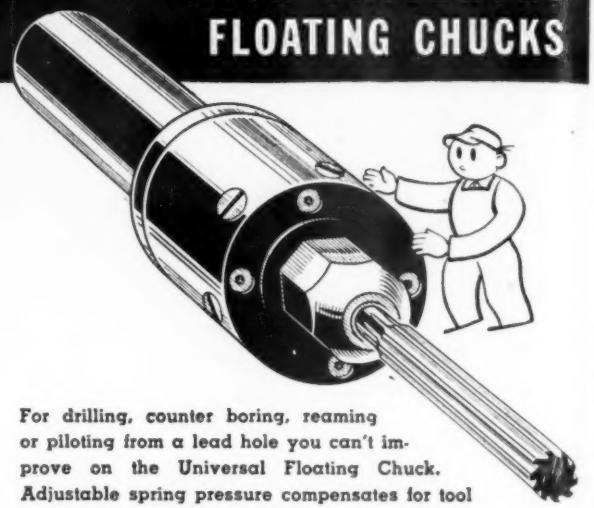

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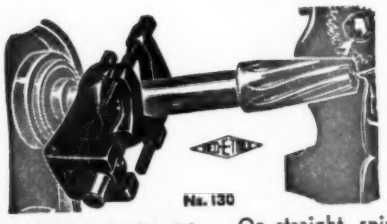

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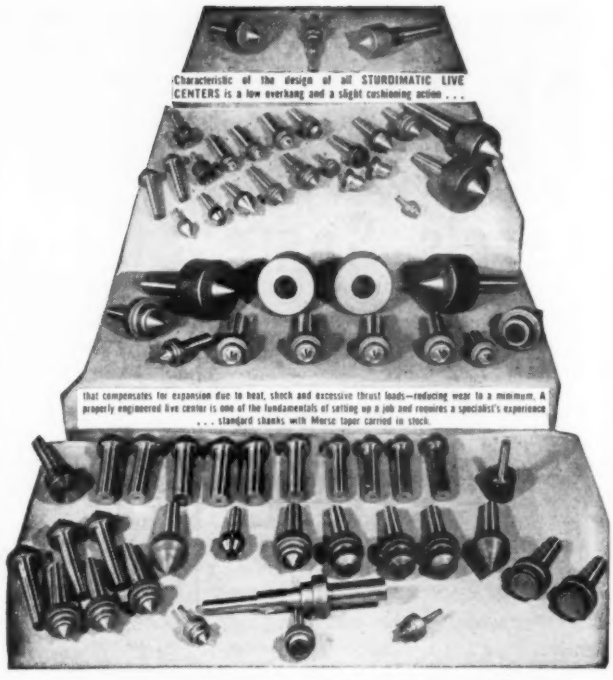
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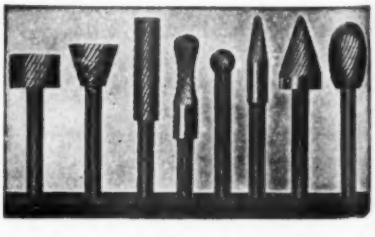

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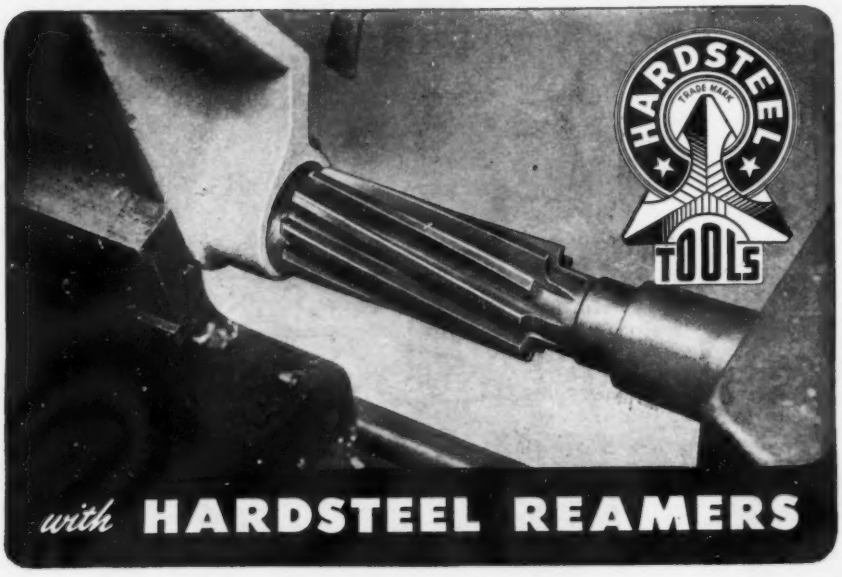

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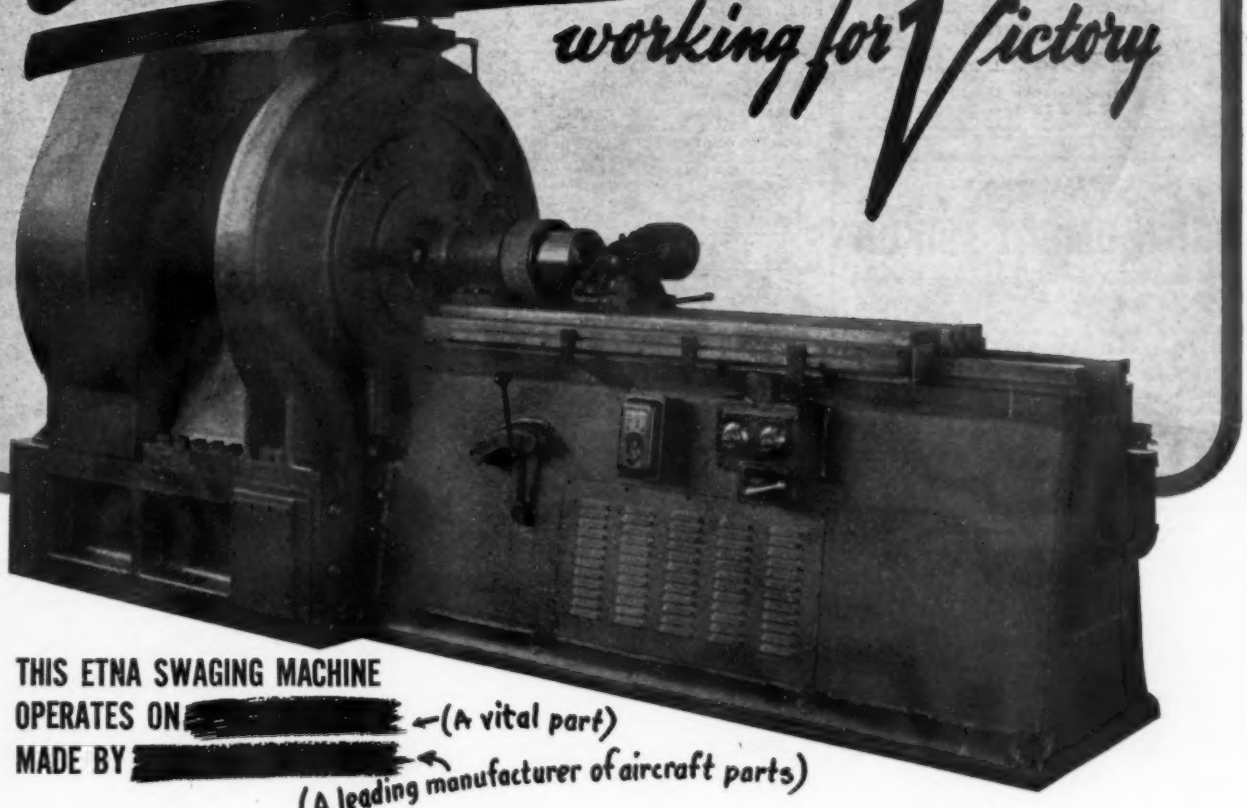

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OPERATES ON [redacted] ←(A vital part)
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ETNA machine capacities range from 3/8" to 8", with die lengths of 1" to 18". Like this manufacturer and many other satisfied users of ETNA Swaging Machines, you can get quality work at less cost, if you'll "Ask ETNA About Swaging" today.

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Must be able to set up milling machines, lathes, screw machines, plan and lay out work. This includes supervising shop of thirty-five men.

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$7,500 YEAR
Location — Manhattan
ONLY U. S. CITIZENS
not engaged at full skill in war work.
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Executives, Engineers, Chemists and Metallurgists!

Qualified men wanted for openings throughout the United States. Write for application, or submit experience record.
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SALARIED POSITIONS — This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

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Now is the time to order your copy. One table, 60 PAGES long, listing all standard screw threads with essential thread data.
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To Determine:

Present Realizable Values of Manufacturing Plants, Machinery and Equipment in entirety or single units.

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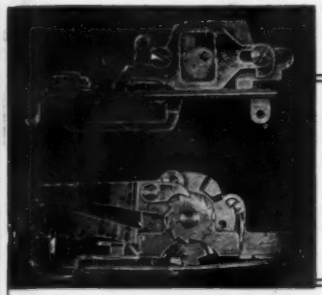

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Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

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In round, flat, square and special shaped wire in all metals.
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Plating and finishing.
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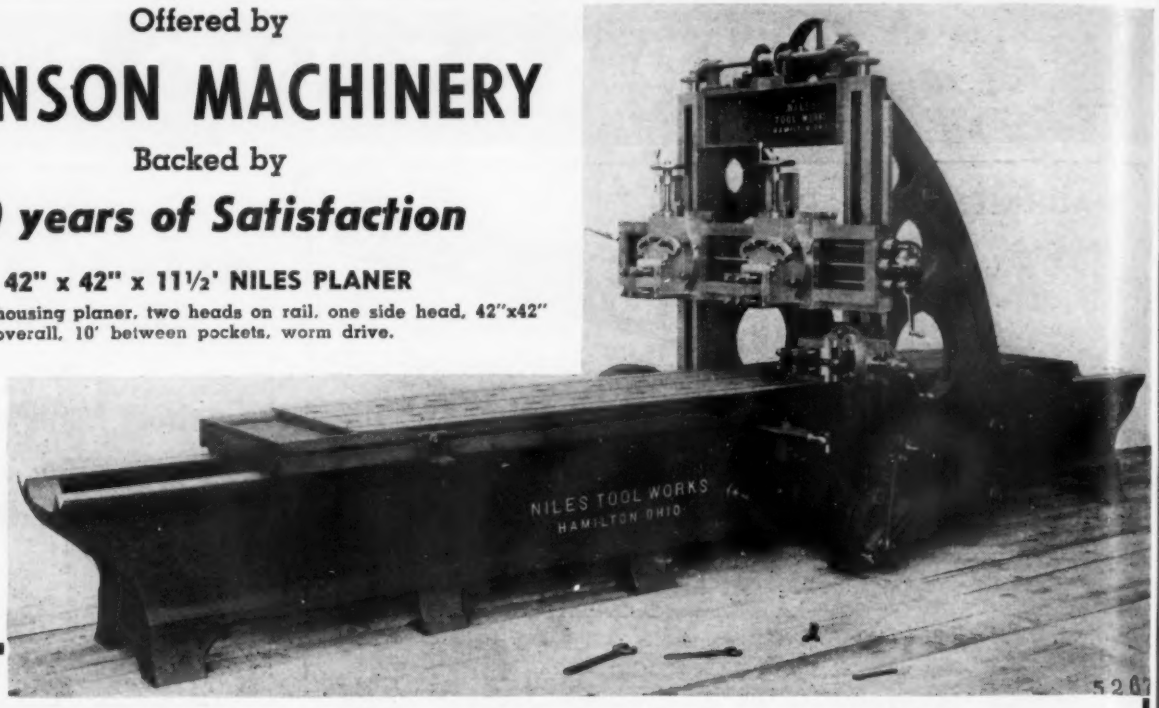
Niles double housing planer, two heads on rail, one side head, 42"x42" x11½' table overall, 10' between pockets, worm drive.



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4" Harnishfeger floor type horizontal boring mill, M.D.

MILLING MACHINES
#3H Le Blond heavy duty milling machine, universal, M.D.

SAW
Espen-Lucas Cold Saw

DRILL PRESS
3 & 4 Spindle Sensitive Drill Press
#12 Pratt & Whitney adjustable multiple spindle drill

PRESSES
#19 Bliss Inclinable Press
#20 Bliss Inclinable Press
#3 Consolidated Inclinable Press

LATHES
1¾" Gisholt turret lathe
16" x 8' Davis quick change lathe

SHAPERS
16" P&W Shaper
16" Kelly Shaper

SCREW MACHINE
#54 National Acme Automatic Screw

271 Halsey St. **JOHNSON MACHINERY COMPANY** Newark, N. J.

BOLT AND PIPE THREADERS—1½" & 3" National; 10" Saunders Pipe; 2½" Landis Bolt, M.D.

BORING MILLS—52" King, 2 hds., P.R.T.

RADIAL DRILLS—6" Cinci, Bickford Pl. Gear box; 4½ Morris Pl. Gear Box.

CHUCKER—#34 New Britain.

GRINDERS—30" x 240" Landis Cyl. 24" Bridgeport Disc D.C., M.D. 24" x 96" Landis Cyl. 20" x 96" Landis Cyl.; 14" x 96" Cinci. M.D.; 12" x 96" Landis; 12" x 120" Landis; #6 Landis Internal; 14" Pratt & Whitney Vert. Surface, Type B, M.D.

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KEYSEATERS—#6 Catlin 40" stroke x 5" wide; #6 M. & M. 31" stroke x 3½" wide.

PLANERS—48" x 48" x 16' Cinci., 4 hds., M.D.; 36" x 36" x 12' Putnam, 3 hds., M.D.; 27" x 6' Woodward Powell, M.D.; 36" x 36" x 10' Cinci., M.D.

LATHES—18" x 6' Greaves Klusman Grd. Hd.; 32" x 12' Pittsburgh, Q.C.G. blocks to 44"; 36" x 16' Bridgeford Grd. Hd., T.A.; 64" x 28' New Haven; 16" x 6' Simplex, Q.C.G.; 22" x 12' Lodge & Shipley, T.A., M.D.; 2¼ x 26" Cinci. Acme Turrets (2).

MILLING MACHINE—#5B Heavy B. & B. Plain, P.B.T., M.D., New 1926.

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30 Church Street New York, N. Y.

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72" x 60" x 28' Pond, Two Heads, Belt Drive. May be inspected under Belt. Priced right before moving.

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18" Niles-Bement-Pond, Motor driven, Power rapid traverse.

CINCINNATI MACHINERY & SUPPLY CO.
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HAVE YOUR NORTON GRINDERS MODERNIZED AND MOTORIZED

WE ARE IN A POSITION TO TAKE ON A LIMITED NUMBER OF THESE AT THE PRESENT TIME

SEE GRINDER AD ON PAGE 377

HILL-CLARKE MACHINERY CO., CHICAGO, ILL.
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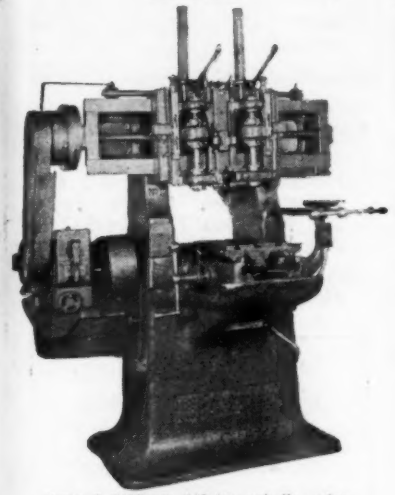
"FALK" for DEPENDABILITY in Rebuilt Machinery

PROFILER



Pratt & Whitney #12 two spindle motorized profiler, Table 12"x15" equipped with 6" raising blocks, and 5 H. P. 3 ph. 60 cy. 220 V. motor—Turner drive mounted and wired to push bottom control—Rebuilt and guaranteed

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P & W Duplex Production Miller #2
Becker #7A Lincoln Production Miller
Sanford #1½ Production Miller, Rotary Table
Cleveland Vertical Miller #1—(New)
Index Universal Vertical Miller (New)
No. 1 Brown & Sharpe Univ. Plain Milling Mach.
No. 1½ American Universal Milling Machine.
1—Gooley & Edlund Production Miller Type A.

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No. 12 Barber-Colman Gear Hobber.
No. 0 Van Norman Pinion Cutter, Univ., 4".
No. 1 Van Norman Pinion Cutter 6" cap.
No. 1 ADAMS FARWELL Gear Hobber; complete.
No. 2 WHITON SPUR 36" GEAR CUTTER, Auto.
1—No. 3 Barber Colman.

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24" Cincinnati Triple Geared Shaper, Fric. Dr.
20"x20"x24" N-B-P SHAPER-PLANER, arr. M.D.
36"x36"x12' Woodward & Powell, 2 heads, belted motor drive.
26x26x7' Gray, single head, belted, m.d.
120"x72"x35' Betts, 4 heads, 50 H.P., D.C. Reversing Motor Drive.

24" Bullard Vertical Turret Lathe Rapid Production, motor drive.
30" Coburn Vertical Turret Mill, M.D.
3½" Rochester Floor Type Horiz. Boring Mill, M.D.

RADIAL DRILLS

1—Niles, Bement-Pond, flat column 5' arm.
Niles Bement-Pond, flat column 6' arm.
4' Bickford, No. 4 M.T., Plain Col., Belt Dr.
3' Ricker-Shafer ½" cap., Radial Tapper.

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No. 1 and No. 2 SLEEPER & HARTLEY BX CABLE COILING MACHINES ⅜ and ¼" cap. Last used for Speedometer cable. Complete.

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No. 5 Bliss Double Crank Forging Press.
No. 4½ Bliss Triple Col. Forging Press.
No. 4 Bliss Double Crank Forging Press.
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2—No. 25N Bliss End Wheel Press, Plain, Motor Dr.
1—No. 3N Bliss End Wheel Press, Geared, Motor Dr.
1—No. 3 Toledo O.B.I., Plain Flywheel.
1—No. 135 Niagara deep throat ⅝ thru ¾ Punch, Motor Drive.
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1—No. 4 Waterbury Open Back Plain Flywheel.
2—No. 18 Bliss Press, Plain Flywheel, O.B.I.
3—No. 18C Bliss Press, Plain Flywheel, O.B.I.
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1—No. 19C Bliss Press, Plain Flywheel, O.B.I.
1—No. 20 Bliss Press, Plain Flywheel, O.B.I.
1—No. 14 Stoll Press, Plain Flywheel, O.B.I.
1—No. 3 American Can, O.B.I., Plain Flywheel.
2—No. 19 Truesdale O.B.I., Plain Flywheel. Same as 19C.
1—No. 6 Waterbury-Farrell Geared, Open Back, on Inclined Legs.
2—No. 4 Manville Perforating Press with Roll Feeds.
1—No. 2½ Consolidated O.B.I. Press with dial feed.
1—No. 1½ G & E Press, O.B.I. with dial feed.
6—No. 2 Bliss Back Flywheel Press.
1—No. P2 Ferracute Back Flywheel Press.
1—No. 71 Waterbury Farrell 25-ton Coining Press.
1—No. 2 Niagara O.B.I. Plain Flywheel Press.
1—No. 3 Niagara O.B.I. Plain Flywheel Press.
1—No. 25 Niagara Arch Press, Plain Flywheel.
1—No. 30 Bliss Arch Press, Plain Flywheel.
5—No. 2, 3 and No. 4 Baxendale O.B.I., Plain Flywheel.
2—No. 0 Waterbury-Farrell Thread Roller.
1—No. 30 Waterbury-Farrell Thread Roller.
2—No. 22 Waterbury-Farrell Cold Headers, Double stroke, solid die, ⅝".
1—No. 33 Waterbury-Farrell Cold Header, Double stroke, solid die, ½".

GRINDERS

14" Pratt & Whitney Vertical Surface Grinder.
No. 6 Besley Double Opposed Disc Grinder.
No. 2 & No. 3 Brown & Sharpe Cutter Grinder.
Taft-Pierce Automatic Pin Grinder.
Gardiner No. 4 Disc Grinder Double End, 20" disc, 16" ring wheel, ball bearing belt drive.
Badger No. 2 Double End Disc Grinder 16" disc, ball bearing spindle. Universal table.
1—Gisholt Drill Grinder.
Badger No. 2—16" Disc. Dbl. End. Univ. Tbls., Belt.
Gardner No. 1—double end Disc, 12", B.B. belt dr.
Gorton, double end disc grinder, 18" discs.
Sellers drill grinder.
#1 Le Blond tool and cutter grinder.

INTERNAL GRINDER

GREENFIELD No. 12, HYDRAULIC FEED, Motor Drive; Cap. swings 15"; Grinds automatically ¾" to 5" dia.; 4" Deep; New in 1928.

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1¼" Gridley "F" 4 spindle Automatic Screw Machine.
Milholland Geared Head Hand Screw Machine 1½" cap. Arranged motor drive, now equipped as Milholland Lassiter Staybolt Machine.
Jones & Lamson 3 x 36", Double Spindle, Motor Driven with Air Truck equipment.
2—No. 0 Brown & Sharpe Automatic Cutoff.
2—9/16 Gridley 4-spindle Automatic.

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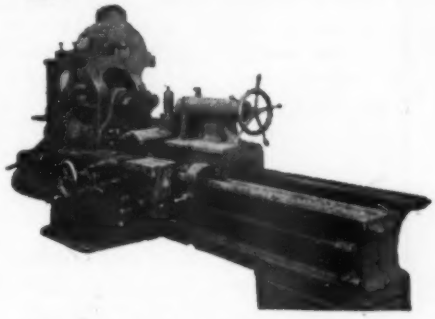
Hall Planetary No. 2—24" Swing.
Loss-Bradner No. 8—10"x54.
Pratt & Whitney 6x14.

LATHES

30"x12' Putnam Quick Change Gear Screw Cutting Engine Lathe, Arranged Motor Drive.
18"x12' Hamilton Plain Change Gear Screw Cutting Lathe.
13x6 South Bend Plain Change Gear Screw Cutting Lathe.
16x6 South Bend Plain Change Gear Screw Cutting Lathe.
1—13 x 6 Seneca Falls Quick Change Gear Lathe
8"x108" Fitchburg LoSwing Production Turning Lathe.
26"x21' Lodge & Shipley Q.C.G., D.B.G. Engine Lathe, taper.



10" x 24" New Logan lathes, with collets, etc.
Lodge & Shipley 26-28" x 21' bed, 14' 6" Centers, Taper Attachment, Pan Bed with Oil Pump.

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MULTIPLE SPINDLE DRILLS

1—15 H Fox Hydraulic 35 spindles, #1 M.T., Motor Drive.
1—D-31 Fox, drilled for 32 spindles, fitted with 16, #2 M.T., rectangular head 17 x 34, power feed, elevating table motor drive.
1—No. 217 Baker, #5 M.T.
1—No. 3 Leland-Gifford 24", 2-spindle with power feed, #3 M.T.
3—Cannedy Otto Upright Drills.

TRIMMERS

2—Waterbury-Farrell Automatic Trimmers ⅝ cap.

THREADING MACHINES

1¼" Acme Single Head Bolt Threader, like new.
Acme ⅝" Double Head.
Acme 3" Single Head.
Landis 1½" Single Head Bolt Threading Machine.
National 2" Double Head, Geared M. Dr.
Williams 6" Pipe Threading Machine.
Merrill 10" Pipe, Motor Drive with motor.
Curtis Portable 4" Pipe Threading Machine.
Williams 2" Pipe Threading Machine.
Jarecki 2" Pipe Threading Machine.
14—Chicago 2-spindle Vertical Threaders—last used on spark plugs.

AUTOMATIC CHUCKING MACHINES

1—No. 24 New Britain type 4 spindle, 5 chucking stations.
1—No. 23 New Britain type 4 spindle, 5 chucking stations.
1—Jones & Lamson Hartness Automatic Chucking Lathe Motor Driven 12" diam., 6" face, 6" width cap.
1—Brown & Sharpe #0 Cutoff, Serial 5563.

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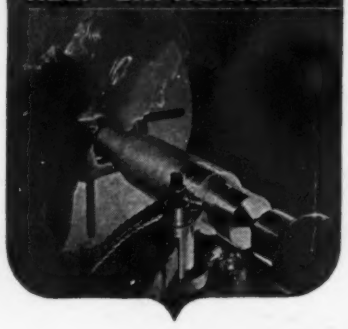

Every machine listed in this column is in our warehouse at press time.

●

No. 3 Warner and Swasey Universal Hallow Hex. Turret Lathe 3⅛ Cop. Belt or Motor Drive.

14" P&W Surface Grinder.

42" PUTNAM Double End Car Wheel Lathe, M.D.

6" x 6" x ⅝" Double Angle Shear.

Beam Shear 20", 60# and smaller.

60" Throat 8" x 1 1/16 Shear.

54" Throat 1¾" x 1⅛" Punch.

6" BILGRIM Bevel Gear Generator.

15" GLEASON Bevel Gear Generator.

No. 9 N.B.P. Vertical Miller 32" rotary table, 4" dia. spindle, M.D.

30" x 30" x 10' NEWTON Slab Miller horizontal arbor, M.D.

24" x 24" x 10' WHITCOMB-BLAISDELL Second Belt Drive Planer.

48" x 48" x 24' NBP Heavy Planer, Two Rail, One Side Head, Motor Drive.

48" x 48" x 20' PATCH Planer, 4 heads, 230 Volt D.C. Rev. Motor Drive.

60" NEWTON Portable Slotter, 230 Volt D.C. Rev. Motor Drive.

24" NEWTON Cold Saw, 7½" capacity, M.D.

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N. Y. Office: 149 Broadway

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MILLING MACHINES
No. 5 Cincinnati Plain, rect. overarm
No. 4 Cincinnati Plain, rect. overarm
No. 5B Brown & Sharpe Plain
No. 2 Cincinnati Plain
No. 1½ Lodge & Davis Universal
No. 2 Knight Vertical
No. 5 Jackson Vertical
18" Cincinnati Duplex Automatic
18" Cincinnati Plain Automatic
24" Cincinnati Plain Automatic
No. 12 Pratt & Whitney Lincoln Type
No. 7H Becker Lincoln Type
Carter & Hakes Lincoln Type
Burr Mfg. Type
18" Cincinnati Mfg.
28" Cincinnati Plain Auto.
4½x12" Pratt & Whitney Thread
6x80" Pratt & Whitney Thread
36"x36"x14' Bement Slab

SLOTTERS
10" Newton
12" Niles
15" Niles
24" Canadian Machinery, m.d.
48" Niles-Bement-Pond
84" Newton
No. 1, 3 National Acme Screw Slotters

PIPE MACHINES
1¼" Landis 2 spindle Pipe & Nipple
2" Bignall & Keeler
2" Brown
4" Curtis & Curtis
4" Eaton, Cole & Burnham
4" Merrell
6" Columbus
8" Bignall & Keeler
16" Cox

PLANNERS
24"x24"x5' G. A. Gray, 1 head
24"x24"x6' G. A. Gray, 1 head
24"x24"x6' Pond, 1 head
30"x30"x10' American, 1 head
30"x30"x14' G. A. Gray, 2 heads
36"x36"x10' Ohio, 1 head
36"x36"x10' Niles, 2 heads
96"x72"x18' Pond, 2 rail heads, 2 side heads

PRESSES
No. 40-S Bliss Straight Side, m.d., 4" stroke, 150 ton cap.
No. 2 Langelier
Waterbury-Farrel S.A. O.B.
D2 Ferracute S.A. Drawing
P2 Ferracute Stiles Type
No. 6 Waterbury-Farrel D.C.
851 Ferracute D.C., 50 tons cap.
30 ton Lourie Hydraulic
Metalwood Hydro-Pneumatic B33
No. 268¼B Toledo D.C. Toggle Drawing
No. 496D Toledo D.C. Toggle Drawing
300 ton Niles Horizontal Wheel Press

PUNCHES & SHEARS
Robinson, cap. 1" thru 1"
Cleveland Model EF D.E., 1¼" thru ¾"
Cleveland Type C S.E. cap. 1¼" thru 1"
No. 6 Long & Allstatter S.E., cap. ½ thru ½"

SAWS
6x6" Klemm Tilting Metal Cutting Band
Espen-Lucas Cold Saw
6" Avey Milband Cut-off Machine
5" Newton Cold Saw
No. 2B, 5, 6 Cochran-Bly Cold Saws
No. 3, 8 Nutter & Barnes Cold Saws
No. 11½ Higley Cold
No. 15 Lea-Simplex Cold
Knowlton Cold, 24" blade

TURRET LATHES AND SCREW MACHINES
No. 2B Foster Universal Geared Head, m.d.
No. 2 Warner & Swasey Universal Hollow Hexagon
18" Libby Type A, 3⅛" hole
26" Libby Type C, 7⅛" hole
20"x7' American Turret
2 spindle 3x36" Jones & Lamson, chucking
3x36" Jones & Lamson, bar

SHEET METAL MACHINERY
Magee Sheet Metal Wiring & Edging, m.d.
No. 10A Quickwork Double Seamer
8' Robinson Brake, 10 ga.
10' No. 204 Dreis & Krump Steel Brake, 10 ga., m.d.
8', 10' Niles-Bement-Pond Flangers, hand operated
½" cap. McCabe Pneumatic Flanger
No. 2 Campbell Nibbler, m.d.
No. 2 Bethlehem Rotary Shear
No. 34, 41 Lennox Rotary
8'—18 ga. Niagara Foot Power Shear
No. 3 Gray Sheet Metal Cutter

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MOREY
DEPENDABLE USED MACHINES

BULLARD 24" R.P. Vertical Turret Lathe—With side head

G & E 48" Gear Cutter

GLEASON 10" Spiral Bevel Gear Gen.

GLEASON 6"-18" Bevel Gear Gen.

HEALD No. 70A Duplex Internal Grinder

HEALD No. 60 Internal Grinder

INGERSOLL 24" Cutter Grinder
LANDIS No. 3½ Int. Hyd. Race Grinder

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Style "C"—Motor Drive, 3 phase, 60 cycle, 220 volt

P. & W. No. 12 Multi-Spindle Drill

NATCO C-13 Hyd. Multiple Spindle Drill

ESPEN LUCAS No. 138 Cold Saw —Cap. 12"

ACME 1" All Steel Upsetter

SAUNDERS 8"-18" Pipe Threader

THEADWELL 12" Pipe Machine

GISHOLT Precision Balancing Machine

LONG & ALSTATTER Angle Shears

AMERICAN 30"x30"x14' Planer 2 heads, M.D.

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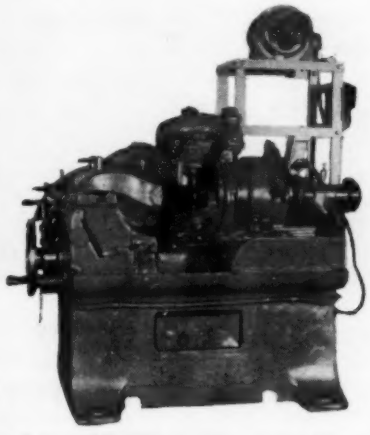
GEAR MACHINES For Immediate Delivery

GEAR HOBBERS



1—No. 48 Jones Gear Hobbers, 72" x 18" capacity

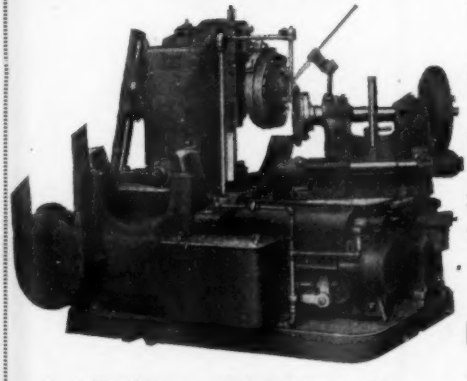
1—No. 12 Barber-Colman Gear Hobber, 12" x 10" capacity

1—No. 3 Adams-Farwell Gear Hobber, 36" x 12" capacity

1—No. 2 Schuhardt & Schutte Gear Hobber, 36" x 12" capacity

4—No. 5A Lees-Bradner Gear Hobbers, 14" x 19" capacity

GEAR GENERATORS

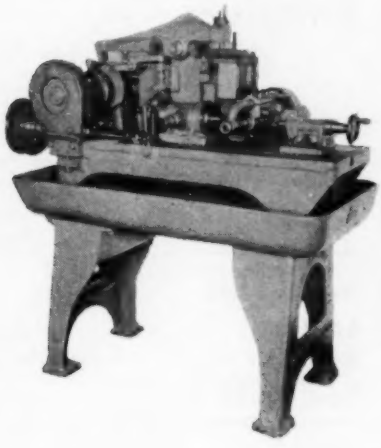


4—15" Gleason Spiral Bevel Gear Generators

1—15" Gleason Bevel Gear Rougher

2—15" Gleason Pinion Gear Roughers

GEAR CUTTERS



1—No. 2½ Bilton Gear Cutter, 6" x 3½" capacity

1—No. 13 Brown & Sharpe Gear Cutter, 18" x 4" capacity

1—No. 4 Brown & Sharpe Gear Cutter, 36" x 12" capacity

1—No. 3 Brown & Sharpe Gear Cutter, 26" x 8" capacity

1—24" x 8" Gould & Eberhardt Gear Cutter

1—36" x 12" Gould & Eberhardt Gear Cutter

1—52" x 12" Gould & Eberhardt Gear Cutter

1—60" x 14" Gould & Eberhardt Gear Cutter

2—No. 1128 Michigan Gear Cutters

1—36-ST-4 sp. Gould & Eberhardt Gear Cutter, 7" x 4" capacity

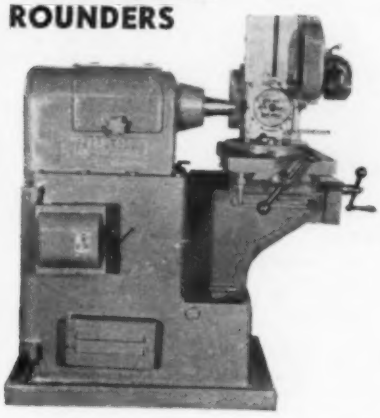
MISCELLANEOUS

3—National Gear Lappers, 7½" x 2" capacity

1—15" Gleason Bevel Gear Tester

2—Pratt & Whitney Gear Tooth Grinders

GEAR TOOTH ROUNDERS



2—No. 3 Peerless Gear Tooth Rounders, 13" dia. capacity

1—20" Ingle Gear Tooth Rounder

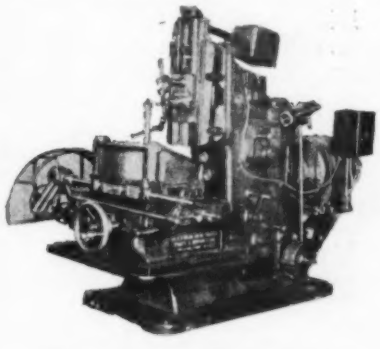
1—No. 40 Cross Gear Tooth Rounder

1—Cross 2-head Gear Tooth Rounder, 10" dia. capacity

1—Lipe 1-sp. Gear Tooth Rounder

1—Lipe 2-sp. Gear Tooth Rounder, 14" dia. capacity

GEAR SHAPERS



1—14" x 7" Maag Gear Shaper

1—No. 615 Fellows Gear Shaper, 26" x 5" capacity

1—36" x 5" Fellows Gear Shaper

1—No. 6 Fellows Gear Shaper 35" x 5" capacity

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⅞" Gridley Model G, four spindle
¾" Gridley Model F, four spindle
1¼" Gridley Model F, four spindle
No. 515 National Acme, four spindle
2½" Cleveland Model A, single spindle
⅝-⅞ Cleveland Model B single spindle

BROACHES

American Hydraulic
Oilgear Hydraulic

DRILLS

30" Superior Upright
36" New Haven Upright
No. 25 Foote-Burt
No. 15½ Foote-Burt Fixed Center
No. 12 Natco Multiple Spindle

GEAR CUTTERS

No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

No. 2 Cincinnati Centerless
22" x 48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
30" Diamond Face, 84" Table Travel
6" x 32" Norton
10" x 20" Landis Cylindrical hydraulic
14" x 50" Norton Cylindrical
No. 4 Landis Universal
No. 1½ Cincinnati Tool & Cutter
No. 60 Heald Cylinder

LATHES

Ames Precision Bench, c.d.
9" Sundstrand Manufacturing, q.h.
18" x 8' Lodge & Shipley, c.d.
32" x 12' Pittsburgh, c.d.

TURRET LATHES

No. 1 Warner & Swasey, c.d.
2A Warner & Swasey, q.h.
18" Libby, q.h.
24" Steinle, q.h.
No. 6A Potter & Johnson, q.h.

MILLS

No. 3 Brown Sharpe Vertical, s.p.d.
No. 4 Cincinnati, c.d.
No. 2 Cincinnati, s.p.d.
No. 12 Brown & Sharpe, c.d.
4" Pratt & Whitney Spline
4½" x 12" Pratt & Whitney Thread Mill

MISCELLANEOUS

10' x 3/16" Stamco Gap Shear
10' x 16 Ga. Ohl Squaring Shear
No. 8 Whiting Comb. Punch & Shear
No. 2 V & O Press, O.B.I.
No. P66 Ferracute

SAWS

6" x 6" Peerless Universal Shaping, m.d.
No. 12 Higley Cold Cut, 16" blade

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Eastern Branch:
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New Britain, 6 spindle, 1⅝" Cap. M.D.
Gridley, Single spindle, 2¼" Cap.
#55 National Acme, 1⅝" Cap. M.D.

BORING MILLS

42" Bullard Vertical, 2 Heads on rail
4" Bickford Horizontal, Single Pulley

GRINDERS

Modern, Cylindrical, 16x60" M.D.
Diamond Surface, 12x14x54" M.D.
Storm 8x10" M.D.

LATHES

Monarch 18"x16'. G.H. Motor in base, taper, Rapid Traverse.
Lathe & Morse 26" x 12'
Rahn & Larmon 18"x36"x8'. Q.C. Taper

MILLERS

#3 Hendey, M.D.
#2 Cincinnati Universal
#3 Garvin-Duplex 12x64"
#7 Becker Production
#5 B, B. & S. M.D.
#3 Universal Pedrick with Vertical.

PLANERS

Bicket (Cincinnati Ohio) 42 x 42 x 12'. Heavy M.D.

RADIAL DRILLS & DRILL PRESSES

6' Niles Universal Radial Drill, 13" round column.
Foote Burt Drill Press, heavy duty.
Gould & Eberhardt Drill Press, 24" Sliding Head, Compound Table.

SHAPERS

From 10" to 24".

TURRET LATHES

#6 Warner & Swasey
Garvin S.P. 12½".
Jones & Lamson, 3 x 36" 2 Sp.

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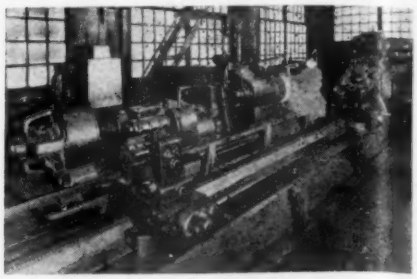

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50" x 28' NORTON ROLL GRINDER, M. D.

GEAR MACHINES

36H G. & E. Universal, Hobber
36" G. & E. Cutter
B. & S. No. 3—26" cutter
Gleason 11" Bevel Generator
Farwell No. 1 Hobber
Fellows No. 6, 61 Shaper

BORING MILLS

10' Niles Vert.
3½" Rochester, M.D.
4", 4½" Gisholt and Niles
54" Colburn M.D.
36" Bullard, Niles

GRINDERS

P. & W. 14", M.D.
Norton 12" x 18", M.D.
Landis 14" x 52"
Modern 12" x 48", M.D.
B. & S. No. 10, 11, 14
Blanchard 26" Surface

AUTOMATICS

3—Potter & Johnston No. 6A Turret Lathes, M.D.

GRIDLEY AUTOMATIC

¾" to 4¼"

LARGE LATHES

48" x 26' Niles
48" x 12' Harrington Gap, sld. bed
26" x 12' Boye & Emmes
26" x 14' Rahn-Larmon rais. blks. to 34"
24" x 14' Rahn-Larmon
36" x 21" Wickes lathe, 3 step
30" x 20' LeBlond Std. Change
24" x 12' LeBlond, M.D.

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10x36	10x72	14x72	16x72
10x50	14x50	14x96	18x96

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

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7" Baird 6 spindle
6x6¾ Goss & DeLeeuw
4½" Gridley model H
1⅝" National Acme No. 55
14" Fay
No. 6A Potter & Johnston
1" Cleveland Model J
No. 16 Gisholt Simplimatic

GEAR MACHINERY

No. 16 HS Gould & Eberhardt hobber
No. 12 Barber Colman hobber
No. 1 Lees Bradner hobber
26"x8" Brown & Sharpe automatic
24"x12" Flather automatic
36"x6" Gould & Eberhardt automatic
48" Brown & Sharpe automatic
60" No. 5A Cincinnati automatic
18" Gleason testers & lappers
15" Gleason spiral gear roughers
15" Gleason spiral pinion roughers
18" Gleason bevel gear generator
2 spindle Lipe chamferer
Pratt & Whitney worm grinder
National gear checker

LATHES

28" Steinle, 8" hole
24" Gisholt, 6⅛" hole
24" Steinle, 6⅛" hole
22" Libby, 4½" hole
2¼x24 & 3"x36" Jones and Lamson
No. 1 ⅝" capacity hand screw
Nos. 4 & 5 Foster
13"x6' Automatic threading
Melling crankshaft 6 cylinder
3½"x36" & 4"x36" Lo Swing lathes
27"x14' Bridgeford heavy turning or axle 2 carriage
8" Sundstrand stub
9" Sundstrand Mfg.
1"x18" Pratt & Whitney automatic
14"x6' Lodge & Shipley with turret on carriage
22"x24" American with turret slide

GRINDERS

10x36 10x50 and 14x50 Norton
12x36 12x52 16x48 and 16x60 Landis
Capitol internal
No. 6 & 15A Bryant internal
20"x59" Safety surface
Nos. 50 & 60 Heald cylinder
18" 24" & 30" Gardner disc
24" No. 84 Gardner opposed disc
24" No. 221 Hanchett opposed disc
20" No. 120A Gardner opposed disc
17"x26"-48" Norton hydraulic crankshaft
Gisholt tool grinder
24" Ingersoll face milling cutter grdr.
30" Ransome elec. snagging
16" Norton snagging
No. 575 Hawes tube polisher
18" Whitney wet tool
36" No. 5TGM Bridgeport wet
Cincinnati face milling cutter grinder
Pratt & Whitney grinder for worms

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No. 3 Turnmilling for round work
Nos. 1 & 1A Davis & Thompson drum type duplex
48" Oesterlein tilted offset
Nos. 10 & 45 Productomatics
5" and 12" Pratt & Whitney automatics
Model AB Becker vertical
Type C Hall planetary thread miller
Taft Pierce thread miller
28" Cincinnati Duplex
3⅝" Beaman & Smith horizontal boring mill
36" Garvin cam & form miller

PLANERS

24"x24"x5' Gray
24"x24"x6' Woodward & Powell
29"x29"x6'3" New Haven
36"x36"x10' Betts 2 heads
36" Morton draw cut shaper

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SAGINAW, MICH.

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16" x 6' Lodge & Shipley Pat. Hd.
16" x 6' Lodge & Shipley Cone, Q.C.
21" x 10' LeBlond Heavy Duty 3 S.C.D. D.B.G.
26" x 10' Niles, Cone, Q.C.

GRINDERS

Fitchburg Spline Shaft Grinder.
#55 Heald Cylinder.
Lees Bradner Gear Grinder.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
18H Gould & Eberhardt Gear Hobber.
#1 Adams Gear Hobber.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#3—26" B & S Gear Cutter.

PLANERS

24" x 24" x 6' Cincinnati Planer.
24" x 24" x 6' Cincinnati Planer, Box bed M.D.
72" x 60" x 28' Pond 2 heads, Belt drive.

MISCELLANEOUS

18" Niles Bement Pond Slotter, Motor driven thru gear box.
12 Ga. 30" Throat Quickwork Shear, M.D.
14" Niles Slotter.
1500# Bell Steam Hammer.

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BORING MILL 84" N.-B.-T., R.P.T., M.D.
GEAR PLANERS, Bevel, 36" & 54" Gleson, M.D.
GRINDER, Surface, UK-500 Hanchett 24"x10' M.D.
LATHE, Turret 27" Libby, 7⅛" H.S. M.D.
LATHE, Turret 34" Gisholt, 4¼" H.S., M.D.
MILLER, Plain No. 1 Cincinnati, M.D.
PRESS, Dbl. Crk. 95-B Toledo, bed 55" x 54".
PRESS, Toggle No. 14 Bliss, stoke 18.
PRESS, Hydr., 1000 ton Wood, platen 42" x 9'.

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BLISS, TOLEDO, V & O, ETC.
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2—Gridley four-spindle Model H Chucking Machines, M. D.
1—No. 2 P & W Shaving Machine
1—72" x 36" x 10' table Ingersoll Mill

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36" Niles Vertical Boring Mill
#1 Pratt & Whitney Two Spindle Gun Barrel Drills
2½' American Plain Radial Drill
12" x 18" Norton type B Semi-Auto. Plain Cylindrical Grinder, M.D.
14"-22" x 36" Norton Gap Plain Cylindrical Grinder MD
24" x 36" Norton type A Plain Cylindrical Grinder, MD
24" x 96" Landis Roll Grinder
#4B Becker Vertical Miller
24" x 24" x 8' Gray Planer
2½" Cleveland Model B Single Spindle Screw Machine
#3 Waterbury Farrel Gang Slitter
2¼" x 24" Jones & Lamson Geared Head Turret Lathes
#12 Pratt & Whitney Two Spindle Profilers

J. L. LUCAS & SON, INC.
BRIDGEPORT CONNECTICUT

#1 B&S Vertical Mill
10" x 36" Thompson Univ. Grinder
3' Silver Plain Radial, Gear Box
2¼" Gridley S. S. Automatic
16" x 6' Sidney Lathe, Timken Spindle

BARRON MACHINERY COMPANY
32 N. Clinton Street Chicago, Illinois

OTT MACHINERY SPECIALS

AUTOMATICS, Acme, #55 & 2"
AUTOMATICS, Gridley, 2¼, 3¼ & 4¼" SS.
AUTOMATICS, Cleveland, 2" 18" feed Model B
AUTOMATICS, Cleveland, ⅞" 4 spdle. cut-off, M.D.
AUTOMATICS, Cone, 2½" 4 spdle., M.D.
AUTOMATICS, #22, 23 & 24 New Britain
AUTOMATICS, Potter & Johnston #5A & 6A
GEAR HOBBERS, #3 & 12 Barber-Colman
GRINDERS, Norton, 14x36" Plain, M.D.
LATHE, Putnam, 60"x17' with 12" Riser Blocs, total swing 85" M.D.
LATHE, 3x36" J. & L. Dble. Spdle.
LATHE, Sundstrand, 8" Stub, M.D.
MILLING MACHINE, #8 Becker Duplex, M.D.
MILLING MACHINES, Craftsman #1 & 2
MILLER & DRILLER, Knight #2
PLANERS, 36x36"x10' Hamilton 2 Heads, M.D.
PLANERS, 42x42"x12' Ohio, 1 Head, M.D.
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Toledo, #2 to 5 Open Back Inclinable
PRESSES, Ferracute, P2, 3 & 4, Solid Back
PROFILERS, 2 spdle. Garvin & #2 Pratt & Whitney

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit, Mich.

MISCELLANEOUS MACHINES

30x30x12' Gray Spur Grd. Planer, m.d.
12x18" Cinci. Plunge Cut Grinder, m.d. with 9" face wheel, and oscil. att.
3' Carlton Sensi. Radial, with tapping att.
6' Niles Plain Radial Drill.
5', 13" col. Cinci-Bick. Plain Radial
#5A P.&J. Chucking Machine, with hardened ways
#45 G.&L. Hydraulic Surface-Grinder with mag. chuck
#4 G.&L. Hydraulic Surface Grinder with mag. chuck

STRONG, CARLISLE & HAMMOND COMPANY
1392 West 3d St. Cleveland, Ohio
2832 E. Grand Blvd. Detroit, Mich.

LATHES

14"x6' Mulliner—cone

GEAR MACHINERY

Type A Barber Colman Gear Hobber
No. 12 Barber Colman Gear Hobber, M.D.
24HS Gould & Eberhard Gear Hobber, M.D.
9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel gear generator
Cimatool gear chamfering M.D.
Lees-Bradner Gear Grinder

TURRET LATHES

6x6½" Goss & DeLeeuw

MISCELLANEOUS

8" Bullard Multimatic M.D.
36'x36"x8' Woodward & Powell Planer Rev. M.D.
No. 303 Bliss St. side. Gd. Press M.D.
Lees-Bradner Spline Hobber 6"x54"

DRILLS

New Delta Drilling Equip.
4 Spindle Taylor & Finn, M.D.

WIGGLESWORTH MACHINERY CO.
203 Bent St., Cambridge, Mass.

ST. LOUIS' Headquarters FOR GOOD USED TOOLS, OFFERS:

ROCKFORD 24" S.P.D. Shaper
COLBURN 42" Vert. Boring Mill
MUELLER 4½" Gear Box Drive Radial Drill
CIN 36"x36"x10' 2-H.D.S. Planer
CONE 4-SP. 1¼" Auto. Screw Mach.
GISHOLT 30" Vert. Turret Lathe
CIN. 48" Pl. Auto. Miller M.D.
NILES 12" Vert. Slotter
INGERSOLL 2—SP. Vert. Miller
B&S 18"x10", #4 Gear Cutter
DIAMOND M. D. Horiz. Surf. Grinder
GOULD & EBERHARDT Rotary Milling Mach.
BIGNALL-KEELER 12" M.D. Pipe Machine

Write Us For Any Other Tools You May Want Let Us Quote On All Machinery Needs

McDONALD MACHINERY CO.
1531-35 N. Broadway St. Louis, Mo.

Prompt ANSWERS to your business problems . . .

MISCELLANEOUS business problems are daily being solved, quickly and easily, by the use of the Searchlight Section of this and other McGraw-Hill publications.

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330 West 42nd Street • New York City

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(Classified Advertising)
SECTIONS are found in these McGRAW-HILL Publications:

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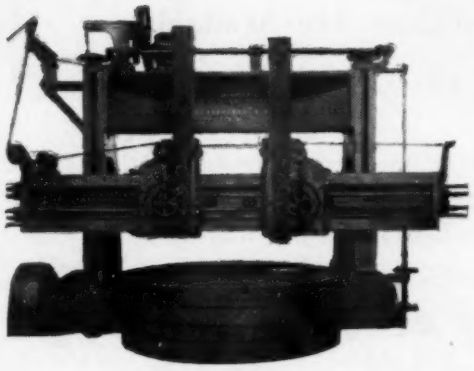
Coal Age
Construction Methods
Electrical Contracting
Electrical Merchandising
Electrical World
Electronics
Engineering & Mining Journal
Engineering News-Record
E. & M. J. Markets
Factory Management & Maintenance
Food Industries
Power
Product Engineering
Textile World

EXCEPTIONAL TOOLS—PROMPT SHIPMENT

VERTICAL BORING MILLS



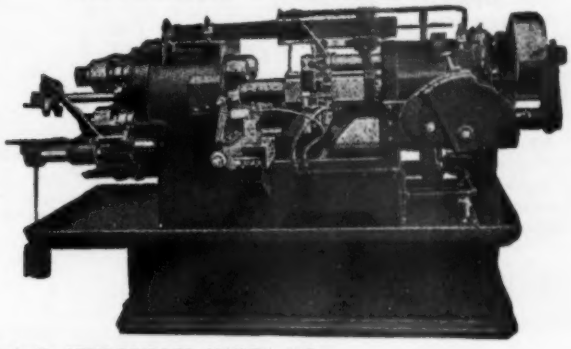
16' NILES, 2 heads on rail, B.M.D.
10' POND, 2 heads on rail.
72" COLBURN, 2 heads on rail, geared feeds, rapid traverse.
51" BULLARD 2 heads on rail. 48" ROCKFORD, 3 sp. M.D.
52" NILES, 2 SWIVEL HEADS.

6" & 8" BULLARD MULT-AU-MATICS

48" NILES BEMENT POND CAR WHEEL BORER.
4 and 6 stations, Direct motor drive.

48" NILES-BEMENT-POND Car Wheel Borer
30" POND Center Drive, Double Axle Lathe.

AUTOMATIC SCREW MACHINES



6 spindle NEW BRITAIN, 1⅝"x7", M.D.
⅞" & 2¼" CONE, 4 spindles. No. 55 NATIONAL ACME.
4" NATIONAL ACME, MODEL B, 4 spindle.
2¼" & ¾" GRIDLEYS, 4 spindles, B.D.
No. 652 NEW BRITAIN AUTOMATIC CHUCKER.

MILLS

VERTICAL: No. 2½B KEARNEY TRECKER; No. 2 B&S.
UNIVERSAL: No. 2 BROWN & SHARPE.
PLAIN: No. 2 CINCINNATI.
24" CINCINNATI AUTO. MD.; 18" CINCINNATI.
10" PRATT & WHITNEY Semi-Auto. Prod. Mill.

TURRET LATHES

No. 3-A WARNER & SWASEY UNIVERSAL;
29" NILES BEMENT POND, 4¼" hole in spindle;
No. 6 BROWN & SHARPE HAND SCREW MACHINE.
No. 16 GISHOLT SIMPLIMATICS.

PLANERS

44" x 32" x 15' NEW ALBANY.
42" x 40" x 13' & 42" x 42" x 14' PATCH.
42" x 45" x 15' BEDFORD; 42" x 45" x 15' LINCOLN.
30" x 30" x 10' DUSTIN; 22" x 20" x 5' POND.

32" FARREL ROLL GRINDER

Grinds rolls max. 34" dia. 10'6" bet. centers; Motors & controls

INTERSTATE MACHINERY CO., INC.
TEL. YARDS 5800
1439 W. PERSHING RD. CHICAGO, ILL.

Send for catalog No. 430

BORING MILLS

Colburn 54", 2 heads.
Niles 53", 2 heads.
Bullard 36", 2 hds.

Canal Machinery Company
176 Lafayette St., New York, N. Y.

UNUSUAL VALUES

Bolt Cutter 1" capacity 3 spindle
Brake Robinson 5' toggle
Compressor 6" x 5" Pennsylvania
Drill, new 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
Drill Presses 20", 24" and 26"
Drill Press, 20" three spindle Barnes
Grinder #20 Bryant deep hole internal
Grinder 60" plate
Grinder #60 Heald, cylinder
Grinder, Sellers Tool
Lathe 14"x12' Lodge-Shipley grd. hd. s.c. mtr. dr.
Motors—new ½ to 30 HP 3 phase ball bearing. Also rebuilt motors
Pipe Machine, 6" Oster (new)
Press #8-7 Zah-Hahnemann straight side grd.
Punch & Shear ⅝" capacity Rock River
Punch & Shear, two ½" capacity
Threading Machine #0 Webster & Perks
Turret Lathe L & D brass, cross slide turret
Vacuum Cleaner, heavy duty for shop use

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DeWITT TOOL COMPANY
173 Grand St. New York City

36" swing x 20' bed **Loose change gear lathe;** triple geared face plate drive.
12x12 and 10x10 **Ingersoll-Rand Air Compressors.**
2 Sp. **Acme Bolt Threader;** 1" Die Heads.
2½" Bar **Horizontal Boring Mill;** 18" travel on bar; 8 speed head; bed 2x6'.
Nos. 2 and 4 **LaPointe Broaches.**
3-A **Warner & Swasey Turret Lathe;** 3⅛" hole in spindle; 1929 machine; tooling for boring.
Taylor & Fenn Internal Grinder; like Heald No. 70; nice condition.
14x6 **Lodge & Shipley quick change lathe;** motor drive unit; chasing dial.
16" **Steptoe Motor-driven Shaper;** back geared.
18" **Gleason Bevel Gear Generator;** nice condition.
No. 3½ **Van Norman Radial Grinder;** capacity up to 9"; automatic or hand feeds.

A. R. Marsh Machinery Co.
4900 West 73rd Street, Cleveland, O.

AIR COMPRESSOR, 526 CFM I-R, belt drive
CRANE, Overhead, 5-ton Shaw, 55' span, D.C.
HOISTS, Superior Iron Works, single drum, 36" dia. with 80 H.P. G.E. Type MTC motor
2—1-ton single motor monorail hoists, A.C. & D.C.
LATHE, 36" Niles, center drive, for truing R.R. wheels mounted on axles, M.D.
Natco Automatic Multiple Drill, 3" with 12 spindles, 34" head (extra heavy duty)
Warner-Swasey Turret Lathes, 25¼" swing, 7 w/6" spindle hole
PIPE THREADING MACHINES
2" Bignall & Keller, 6" Oster & 6" Williams
UPSETTING & FORGING MACHINES, 2" to 4" cap. Lot of Electric A.C. & D.C. Motors

(Write for our complete list ! ! !)

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13498 S. Brainard Ave., Chicago, Illinois
"Anything containing IRON or STEEL"

HYDRAULIC EQUIPMENT SPECIALS

2—400 Ton Presses, 65" x 42" Platens, 7'-5" Daylight, 14" Diam. x 30" Stroke Up-moving Ram, 5200# WP.
1—175 Ton Press, 28" x 21" Platens, 32" Daylight, 14" Diam. x 18" Stroke, Up-moving Ram, 2500# W.P.
1—150 Ton Press, 37" x 32" Platens, 9" Daylight, 15" Diam. x 12" Stroke, Up-moving Ram, 1800# WP.
1—Chambersburg Triplex, Double Throw Horizontal Hydraulic Pump, Size 3" x 12", 150 HP Capacity, 100 GPM, 2000# WP, Arranged For Geared Motor Drive.
1—Worthington Duplex Double Acting Hydraulic Pump, Size 14" x 2½" x 12", Capacity 50 GPM, 2000# Hydraulic WP.
1—Camden Weighted Type Accumulator, 13" Diam. x 12' Stroke Ram, 83 GPS, 2000# WP, Tank 11' Dia. x 11' High.

All Offered Reconditioned and Guaranteed. Prompt Shipment. Drawings and Other Data on Request. Other Sizes of Presses, Pumps, Accumulators of All Types. Write, Wire or 'Phone for Details.

We also Handle Motors, Compressors, Boilers, Machine Tools, Etc.

INDUSTRIAL EQUIPMENT CO.
856 Broad Street Newark, N. J.

24" **Bullard "New Era" Boring Mill.**
1000# & 2000# **Steam Forging Hammers.**
#14 **Cochrane-Bly Vert. Miller & Shaper,** M.D.
50" **G & E Gear Cutter.**
#55 **Heald Internal Grinder.**
10" **Bridgeport Knife Grinder.**
20"-24" **G & E Shapers**
36" **Morton Draw Cut Chaper.**
No. 2 **Baker Keyseater,** 2"x20".

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

36' x 24" **PUTNAM** Heavy Duty Triple Geared, Internal Geared Faceplate Drive Engine Lathe. Arranged for motor drive. Swings over ways—38".
LANDIS 8" to 18" inclusive Pipe Threading Machine. Gear box, single pulley drive.

ALSO MANY OTHER TOOLS

ALEX ZEEVE & COMPANY
2269 Woolworth Bldg. New York, N. Y.

ALL MOTOR DRIVEN

Boye & Emmes Lathe 24"x12'
Rickert & Schaefer Tapping Machine
Oster Cut-off Machine
Barnes 2 Way Horizontal Boring & Drilling Machine #430
Foote-Burt 4 Spindle Drilling Machine
Metalwood Hydraulic Press
Lips Chamfering Machine
Double End Centering Machine
Gisholt 21" Turret Lathe
High Speed Riveting Hammer
Toledo #31 Punch Press
Toledo Machine Co. #33 Punch Press
Garvin #2 Tapper
Landis 2 Spindle 1" Bolt Cutter
Landis 2½" Capacity Bolt Cutter
Flexible #83 Power Press—8 Ton—3 Post
Hanna 20 Ton Stationary Compression Yoke Riveter Complete—10x10 Gap
Detroit 5 Spindle #2 Semi-Automatic Drill
J. N. LaPoint #3 Double End Broach
Barber Colman #12 Hobbing Machine
Blakeslee Special D P Model Degreaser

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Foot of W. 83rd St. Cleveland, Ohio
Tel. ATlantic 2400 Att: Mr. H. O. Ash

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6—Bradley 40# Helve Type Forging Hammers. Price $250.00 each

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MONA MEMBER

JOSEPH BEAL & CO.
465 Atlantic Ave. Boston, Mass.
Hancock 6460

GOOD MACHINES
Immediate Shipment!

FOSTER #3B Universal Turret Lathe; 5" hole, for chucking.
FOSTER #1B Universal Turret Lathe; 2⅝ hole, for chucking.
ACME 3¼" Universal Turret Lathe; geared head, for bar work.
NILES 8' Boring Mill; 2 swivel heads.
BULLARD 7" Mult-Au-Matic; M.D.
GREENFIELD #52 Hydroil Internal Grinder.
POND 84" x 72" x 20" Planer; 4 heads, M.D.
CINCINNATI-BICKFORD 6' Semi-Universal Radial Drill; auxiliary table.

Send for Complete Listing

ACME EQUIPMENT CO. MONA MEMBER
128 So. Clinton St., CHICAGO, ILL.
Phone ANDover 3431

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Confidential negotiations.

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Rebuilt Gleason Lathe. 10' by 24"; 80" centers.
Barnes Drill. No. 4 Morris Taper 22½"; A.F. & B.G. Rebuilt.
Heavy Drill. 33", 8' high. No. 5 taper. B.G. & A.F.
4 Spindle Upright Nut Tapper. Up to ½" thread. Excell. Cond.
Heavy Wire or Rod Straightener. Up to ½".
Roth 5 H.P. Buffer. A.C. 60 cycle.

JAY SALTER
534 So. Goodman Rochester, N. Y.

FOR SALE
GRINDER
Blanchard 16A, Automatic Grinder, Serial 1973, 30" dia. chuck, 30 H.P., 3 phase, 60 cycle, 3 phase, 220 or 440 motor in spindle. Purchased in 1929.
Standard Machinery & Supply Co.
218 High Street Boston, Mass.

FOR SALE
LATHE
Lodge & Shipley 36" x 12' Selective 12-Speed Geared Head Lathe with 36" chuck, taper attachment, 15 H.P., 220-volt, 60-cycle, 3-phase motor—excellent condition.
OGDEN R. ADAMS
264-266 State St. Main 6374-5
Rochester, New York

FOR IMMEDIATE DELIVERY
Sundstrand Duplex Rigidmil; 40" Between Housings; Timken Spindles; 16" x 72" Table; Hydraulic Table Feeds; A.C. Motor Driven Rebuilt & Guaranteed.
BARRON MACHINERY COMPANY
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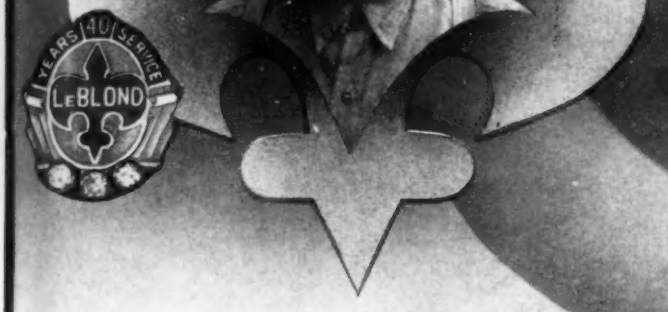
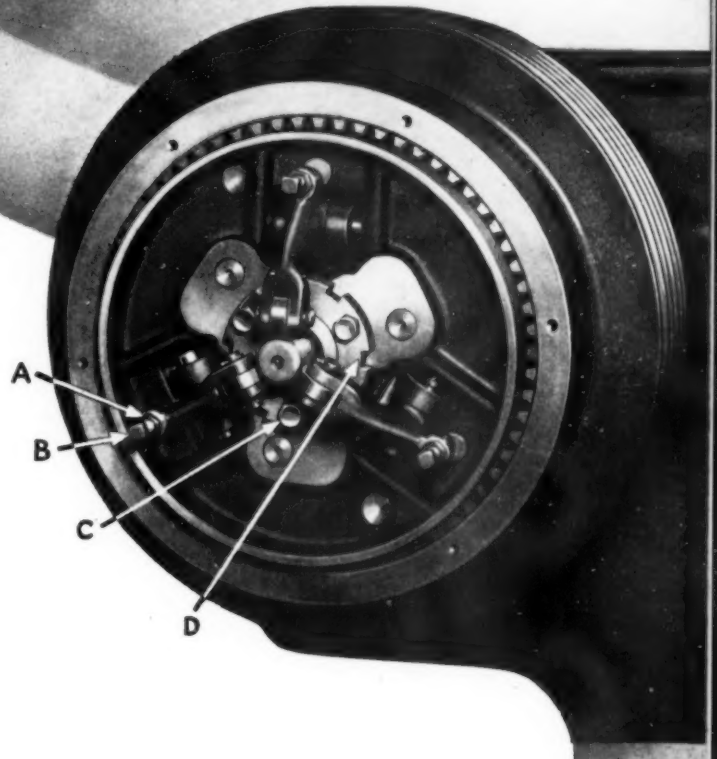
I'm Tellin' You··

No. 10 in a Series of Tips on "Keeping 'em Turning"
by Tom Toker, 40 years at LeBlond



Any lathe requires adjustment from time to time. How often depends on the type of operation and sometimes on the operator. Although it is seldom needed, the clutch is one spot to watch. If I tried to explain the "whys and wherefores" of the mechanics involved in the LeBlond clutch, it would take several of these pages, which the "front office boys" assure me can't be bought with marbles. So without going into details, here are two symptoms of trouble and their remedies:



Loss of power — When the lathe slows under cut and the flow of power is irregular or jumpy, it's a pretty fair sign that the clutch is slipping.

Here's the remedy:

1. Put clutch in engaged position.
2. Drain oil through plug at bottom of clutch cover.
3. Remove the six screws to take off cover.
4. Loosen three lock nuts on clutch fingers (A).
5. Turn three screws equal degrees to the right (B).
6. Tighten three screws (B) until belt slips when spindle is blocked. With even adjustment, push rod will run dead center.
7. Tighten lock nuts (A).
8. Replace cover, refill with oil.

Hot clutch box — When there is too little clearance between the clutch plates while the lathe idles, friction overheats the non-circulating oil, breaking down its lubricating properties. When this happens, the cover plate will be hot to the touch.

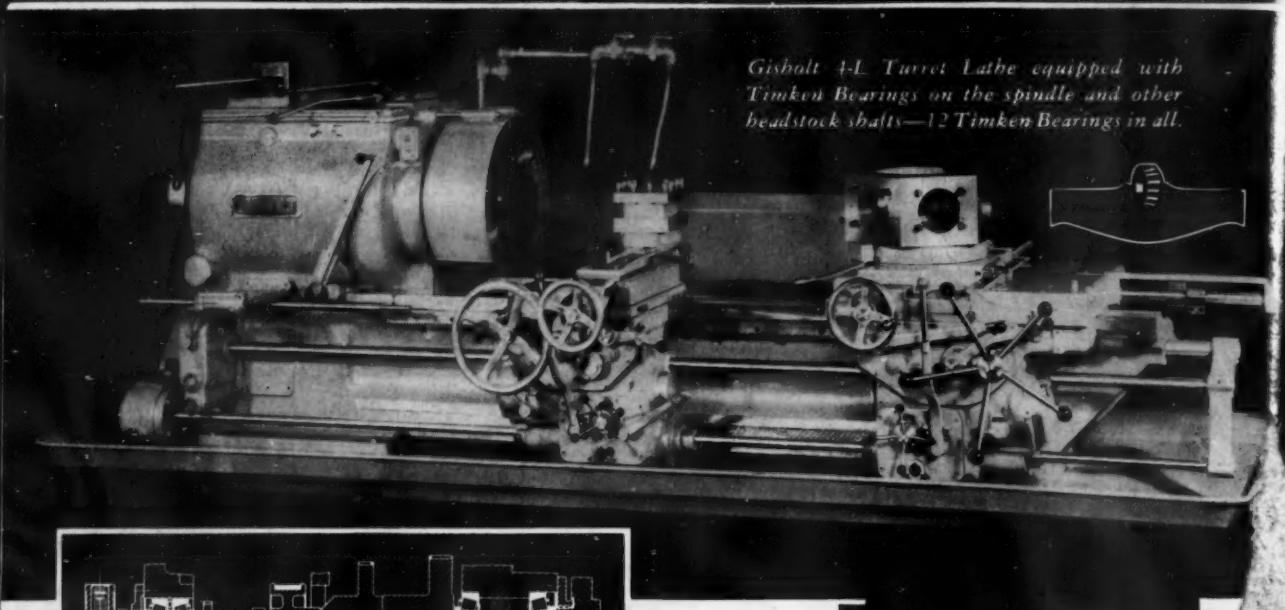
Here's what to do:

1. With the oil drained, cover plate removed and clutch engaged, remove three screws (C).
2. Use a spanner wrench to tighten lug nut (D).
3. After checking manual for exact number of turns, back off lug nut. Check with feeler gauge the space specified between clutch hub and adjusting nut.
4. Replace screws (C) to draw clutch assembly tight against nut in proper operating position.
5. Replace cover plate and refill with oil.

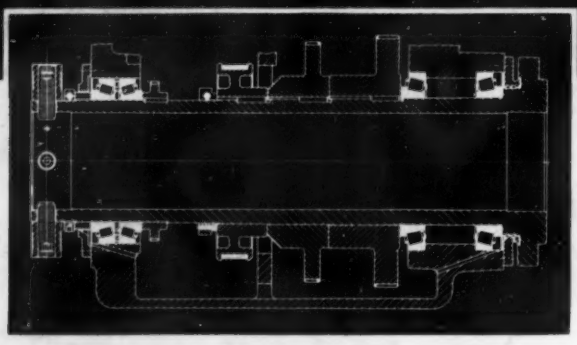
ARMY E NAVY

THE [illegible] LeBLOND MACHINE TOOL CO.
CINCINNATI, OHIO

Largest Manufacturer of a Complete Line of Lathes



Gisholt 4-L Turret Lathe equipped with Timken Bearings on the spindle and other headstock shafts—12 Timken Bearings in all.



Application of Timken Bearings on the spindle of the Gisholt 4-L Turret Lathe.

Every additional Timken Bearing that goes into a heavy duty machine tool of any kind is another important contribution to improved performance. Assuming that you now are mounting your machine spindles on Timken Tapered Roller Bearings—as an overwhelming majority of heavy duty machine manufacturers are doing—there still are other positions where the application of Timken Bearings presents opportunities for further improvement in speed, precision, endurance and reduced maintenance; namely, all headstock shafts, feed mechanisms and tailstock centers.

A few Timken Bearings are better than none in any machine, but the maximum advantages which they make possible can only be realized when there are Timken Bearings at *every* point of friction and hard service. It will pay you to put them there, for then you not only will have *better* machines — but also *better selling* machines, because throughout industry no name in bearings is so well-known nor has so much influence with machine buyers as "TIMKEN". The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS